THE FOUNDRY for October

Knowledge UNBOUNDED

NO NATION, race or people possesses a monopoly of knowledge. Practical and technical skill in castings manufacture is not confined within political or geographical boundaries. Exemplification of this truth may be found in the International Foundry Congress in Philadelphia this month, the fifth of such gatherings in which American foundrymen are privileged to take part. Fostered by the co-operative spirit of foundrymen, a system of exchange papers on foundry subjects has been in operation between the A. F. A. and European societies since 1921. Many from this side have visited Europe to inspect and learn their practices, including those who participated in the first world congress in Paris in 1923 and the third in London in 1929. Facts and information gained are directly valuable, but greater by far is the contribution to better understanding among various nations. As a basis for peace and progress, understanding is essential. THE FOUNDRY, on behalf of American foundrymen welcomes the overseas delegates and visitors to the fifth world congress. May the trip be profitable in knowledge gained, in pleasure and in understanding of the American people.

Revising THE RULES

DAY to day reports of the revision of NRA since the retirement of Gen. Johnson, veer with the wind in the manner of all trial balloons. The outcome is clouded. Such uncertainty may be expected for many months. Meantime, in the foundry industry the four main branches are under codes. Many of the original hopes of code writing days have evaporated, plans for securing definite relief from business ills have been wrecked by tampering theorists, consolidation of interests upon a broad front of the foundry as a process industry has been torn down by the whittling of those interested in advancing various product classifications. Accordingly, any salvage of possible benefit to the industry must come through the skill and judgment of its leaders.

This cannot be brought about by remote control. No code authority group, no matter how able, unselfish and aggressive can hold together a structure of any value to the industry without the backing of the great number of the members therein. This backing and support comes only through contact and mutual trust. Fortunately, in the foundry industry there has been little of the tendency to "crack down" or to use the punitive provisions of the codes in retribution upon competitors. Nor has there been undue exertion of pressure to put across individual ideas in costs, price reporting plans or other favored measures.

Therefore, all four main branches of the industry stand in good position to retain and perpetuate such benefits as may be found in co-operative action. Members of the industry in all cases should be given an opportunity, not only to receive and consider advice and rulings from the code authority sent them frequently by mail, but they should be encouraged to contribute their part. The general industry meeting of the nonferrous association held in Chicago last month and reported in this issue is an example of cultivating this co-operation. All sections, many divergent interests and individuals from large and small shops brought to this conference thoughts and suggestions of great value to the industry. Chapter and sectional meetings are valuable and the more frequently local groups can assemble, the better. But the general industry meeting remains the best source of expression and the best basis for securing positive progressive action both for the foundries of the industry and their respective code authority members.

View of the Philadelphia parkway with the city hall in the right background

Convention Draws World Foundrymen

Leaders from Europe and America meet in Philadelphia to discuss common problems

RICH with tradition as the nation's cradle and close to the hearts of foundrymen as the birthplace of the American Foundrymen's association, Philadelphia awaits with eager welcome to greet the thirty-eighth annual convention and exposition of A. F. A. and the Fifth International Foundrymen's congress during the week of Oct. 21. No lethargy of business care, nor pall of present public turmoil can halt or dim the power and the benefit of a gathering which will mark a new milestone in foundry progress.

Coupled with the wide diversity of technical information provided in the technical sessions, roundtables and practical shop courses, advance in foundry practice, all that is new and revolutionary in castings production, metallurgy and the thousand details of materials and their scientific use will be brought before these sessions. The first extensive major, operating exhibit of foundry equipment and supplies since the Cleveland convention in 1930 will be staged in the new and ample Philadelphia convention hall. A peep behind the scenes of the exhibition gives proof of new and radical advances, a wider range of new devices and machinery than ever before have emerged within a similar period of time. Equipment and supply producers have been diligent and successful in sensing the needs and meeting the requirements of the foundry industry under conditions at hand.

The American Foundrymen's association is host to the world congress of foundrymen for the second time since international exchange of foundry information was established. A large party of European foundrymen and technical leaders, following a preconvention tour covering leading eastern foundry centers, will take part in the Fifth International Foundrymen's Congress. Papers from leading European associations, always a feature of the A. F. A. conventions in past years, will be made more valuable through the attendance at the sessions and participation of the overseas visitors.

In recognition of the foresight and service to the industry of that group who in 1896 participated in the first national gathering of foundrymen and organized the American Foundrymen's association, invitations have been extended to all those known to have been at the first convention, also held in Philadelphia. They will be the guests of the 1934 convention, honored as veterans and pioneers.

Arrange Trip to Bethlehem

A feature of unique interest and one which offers an unusual opportunity is a special group plant visitation to the Bethlehem Steel Co. plant at Bethlehem, Pa. The committee of the Philadelphia Foundrymen's association has arranged for a special train, Friday noon, Oct. 26, which will carry this party to the Bethlehem plant to inspect their steel works and foundries, returning in the late afternoon.

Technical features of the convention are much broader in scope than the program offered at any of the more recent gatherings of the association. Remarkable developments in the many ramifications of castings manufacture during the past few years offer a wealth of material seldom provided in a single industry in a similar short period of time. In addition to a complete coverage of the startling innovations in the production of steel, gray iron, malleable iron and nonferrous castings, the 1934 technical program features an exceedingly valuable list of papers dealing with the practical phases of foundry practice.

Philadelphia is rich in historical settings, with Independence hall attracting the greatest interest from the visitor

The downtown section of Philadelphia holds much of interest for the visitor. This is a view of Broad street, one of the busy thoroughfares

Shop operation courses, one of the most important features and best attended sessions at recent conventions, again will be conducted for the interchange of practical ideas in informal discussion, the sessions this year being devoted to sand control and gray iron founding. Sand control shop courses will be held at 2:30 p.m. on Monday, and at 9 a.m. on Tuesday, Wednesday, Thursday and Friday. Gray iron shop courses are scheduled for 4 p.m. on Monday, Tuesday, Wednesday and Thursday.

Formal Opening Monday Noon

Pomp and ceremony will mark the formal opening of the exposition of foundry equipment and supplies at noon on Monday. The remainder of the day will be devoted to meetings of important committees of the A. F. A. The shop operation course will be devoted to "Application of Sand Control to Continuous Jobbing Foundries," and the gray iron shop course to "General Cupola Practice." The annual alumni dinner will be held that evening at the Bellevue Stratford hotel.

The Fifth International Foundry congress will convene officially on Tuesday morning at the formal opening meeting, with President Frank J. Lanahan presiding. The technical session will get under way Tuesday afternoon, with meetings scheduled on nonferrous founding, steel founding, and apprentice training. At the nonferrous session the following papers

Session Schedule For Convention Week

Monday, Oct. 22

Registration and Committee Meetings
12:00 noon—Formal Opening of
2:00 p. m.—Cost Committee
2:30 p.m.—Sand Shop Course
3:00 p.m.—Code Authority of Foundry Equipment Industry
4:00 p.m.—Gray Iron Course
7:00 p.m.—Alumni Dinner

Tuesday, Oct. 23

9:00 a.m.—Sand Control Shop Course
10:00 a.m.—Formal Opening
12:30 p.m.—Fluidity Test Committee
2:30 p.m.—Nonferrous Founding
Steel Founding
Apprentice Training
4:00 p.m.—Gray Iron Course
6:30 p.m.—FEMA Dinner
9:00 p.m.—Reception to Overseas Guests

Wednesday, Oct. 24

9:00 a.m.—Sand Shop Course
10:00 a.m.—Steel Founding
Nonferrous Founding
Cast Iron Founding
12:30 p.m.—Nonferrous Round Table Luncheon
Steel Castings Round Table Luncheon
1:30 p.m.—Joint Committee on Foundry Refractories
2:30 p.m.—Pattern Making
Refractories
3:00 p.m.—Cast Iron Advisory Committee
4:00 p.m.—Steel Division Advisory Committee
Gray Iron Shop Course
4:30 p.m.—Nonferrous Division Advisory Committee
7:00 p.m.—Annual Banquet

Thursday, Oct. 25

9:00 a.m.—Sand Shop Course
10:00 a.m.—Cast Iron Founding
Malleable Cast Iron
Steel Founding
12:15 p.m.—Malleable Cast Iron Round Table Luncheon
Iron Round Table Luncheon
2:00 p.m.—Malleable Division Advisory Committee
3:00 p.m.—Annual Business
4:00 p.m.—Gray Iron Course
6:30 p.m.—Dinner for Instructors in Engineering and Foundry Practice

Friday, Oct. 26

9:00 a.m.—Sand Control and Research
Cast Iron Tests and Specifica-
Materials Handling
12:30 p.m.—Special Visit to Plant of Bethlehem Steel Co., Bethlehem, Pa. Trip by Train

will be presented: "Effects of Elevated Temperatures on the Strength and Dimensional Stability of Certain Aluminum Alloys Used in Aircraft," by R. R. Kennedy, Wright Field, Dayton, O.; "Porosity in Leaded Bronze Bushings," by A. W. Lorenz, Bucyrus-Erie Co., Milwaukee; and "Cupola Melting of Red Brass," by W. C. Alvin, Imperial Brass Mfg. Co., Chicago. The nonferrous division will hold a business session at the close of that meeting.

Papers on steel founding, to be presented Tuesday afternoon, include: "Controlled Directional Solidification," by George Batty, Steel Castings Development bureau, Philadelphia; and "Studies on Solidification and Contraction of Steel Castings," by C. W. Briggs and R. A. Gezelius, Naval Research laboratory, Washington. W. E. Patterson, recently designated as executive secretary of the Federal committee on apprentice training to set in motion plans for introducing apprentice training as a phase of NRA Code Administration will address an important meeting on apprentice training at 2:30 Tuesday afternoon.

"Classification of Foundry Sand," will feature the sand control shop course on Tuesday, while the gray iron shop course will be devoted to "Cupola Fore Hearths" and will include a paper on that subject by G. S. Evans, Mathieson Alkali Works, New York.

A special reception for the overseas guests will be tendered by the American Foundrymen's association Tuesday evening, at the Franklin institute, starting at 9 p.m. A dinner for the Foundry Equipment Manufacturers association is scheduled for earlier that evening.

The peak of technical activities will be reached on Wednesday, with sessions on steel founding, nonferrous founding, and cast iron founding, in the morning, round table luncheons on nonferrous foundry practice and steel foundry practice at noon, and sessions on refractories and patternmaking in the afternoon. W. C. Woodward, George A. Smith Steel Castings Co., Milwaukee, C. E. Sims, American Steel Foundries, East Chicago, Ind., George

View of a portion of the city of Philadelphia, including the downtown section. The location of the exhibition hall, pictured at the top, is shown by the arrow

Program of Technical Papers For Philadelphia Meetings

Monday, Oct. 22

Registration, Main Lobby, Convention Hall

12:00 Noon—Formal Opening of Exposition.

2:00 p.m.—Cost Committee.

2:30 p.m.—Sand Control Shop Course.

Application of Sand Control to Continuous and Jobbing Foundries.
Chairman, A. V. Leun, Bethlehem Steel Co., Bethlehem, Pa.; vice chairman, L. B. Knight Jr., National Engineering Co., Chicago.

3:00 p.m.—Code Authority of Foundry Equipment Industry.

4:00 p.m.—Gray Iron Shop Course.

General Cupola Practice.
Chairman, P. T. Bancroft, John Deere Harvester Works, East Moline, Ill.; discussion leader, W. H. Spencer, American Cast Iron Pipe Co., Birmingham, Ala.

7:00 p.m.—Annual Alumni Dinner.

Tuesday, Oct. 23

9:00 a.m.—Sand Control Shop Course.

Classification of Foundry Sands.
Chairman, Dr. H. Ries, Cornell University, Ithaca, N. Y.; vice chairman, W. G. Reichert, Singer Mfg. Co., Elizabeth, N. J.

10:00 a.m.—Formal Opening Meeting.

Convening of Fifth International Foundry Congress.
Chairman, President of A. F. A., Frank J. Lanahan, Fort Pitt Malleable Iron Co., Pittsburgh.

12:30 p.m.—Fluidity Test Committee.

2:30 p.m.—Nonferrous Founding.

Chairman, Sam Tour, Lucius Pitkin Inc., New York; vice chairman, Jerome Strauss, Vanadium Corp. of America, Bridgeville, Pa.
Effects of Elevated Temperatures on the Strength and Dimensional Stability of Certain Aluminum Alloys Used In Aircraft, by R. R. Kennedy, Wright Field, Dayton, O.
Porosity in Leaded Bronze Bushings, by A. W. Lorenz, Bucyrus-Erie Co., Milwaukee.
Cupola Melting of Red Brass, by W. C. Alvin, Imperial Brass Mfg. Co., Chicago.
Nonferrous Division Business Session.

2:30 p.m.—Steel Founding.

Chairman, R. A. Bull, Consultant on Steel Castings, Chicago; vice chairman, P. E. McKinney, Bethlehem Steel Co., Bethlehem, Pa.
Controlled Directional Solidification, by George Batty, Steel Castings Development Bureau, Philadelphia.
Studies on Solidification and Contraction of Steel Castings, by C. W. Briggs and R. A. Gezelius, Naval Research Laboratory, Washington.

2:30 p.m.—Apprentice Training.

4:00 p.m.—Gray Iron Shop Course.

Cupola Fore Hearths.
Chairman, Garnet Phillips, Frank Foundries Corp., Moline, Ill.
Cupola Fore Hearths, by G. S. Evans, Mathieson Alkali Works, New York.

6:30 p.m.—Foundry Equipment Manufacturers' Association Dinner.

9:00 p.m.—Reception to Overseas Guests.

Wednesday, Oct. 24

9:00 a.m.—Sand Control Shop Course.

Sand Defects: Causes and Remedies.
Chairman, R. F. Harrington, Hunt Spiller Mfg. Corp., Boston; discussion leader, J. A. Sweeney, foreman in charge of pipe foundries, Florence Pipe Foundry & Machine Co., Florence, N. J.

10:00 a.m.—Steel Founding.

Porosity in Steel Castings.
Chairman, F. A. Melmoth, Detroit Steel Casting Co., Detroit; vice chairman, J. M. Sampson, General Electric Co., Schenectady, N. Y.
W. C. Woodward, George H. Smith Steel Castings Co., Milwaukee.
C. E. Sims, American Steel Foundries, East Chicago, Ind.
George Batty, Steel Castings Development Bureau, Philadelphia.
R. A. Bull, Consultant on Steel Castings, Chicago.

10:00 a.m.—Nonferrous Founding.

Symposium on Deoxidation and Degasification of Nonferrous Casting Alloys.
Chairman, T. E. Kihlgren, International Nickel Co., Bayonne, N. J.; vice chairman, Dr. C. H. Lorig, Battelle Memorial Institute, Columbus, O.
Introduction—Discussion of General Principles, by C. H. Lorig, Battelle Memorial Institute.
Bronze Foundry Alloys, Committee Report, by O. W. Ellis, Ontario Research Foundation, Toronto, Ont., Chairman.
Yellow Brass Casting Alloys, by L. Ward, Chase Brass & Copper Co., Waterbury, Conn.
Aluminum and Its Alloys, by H. J. Rowe, Aluminum Co. of America, Cleveland.

10:00 a.m.—Cast Iron Founding.

Chairman, J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala.; vice chairman, R. F. Harrington, Hunt-Spiller Mfg. Corp., Boston.
Breaking Strength and Physical Properties of Gray Iron, by J. Navarro-Alcacer, Valencia, Spain (Spanish Exchange Paper).
Permanent Mold Castings, by Fred J. Walls, Eaton-Erb Foundry Co., Detroit.
Study of the Fluidity of Cast Iron—Report of Committee of Belgian Research Foundation. (Belgian Exchange Paper.)
High Chromium Cast Iron, by Garnet Phillips, Frank Foundries Corp., Moline, Ill.
Certainty of Results as the Basis in Manufacture of High Grade Cast Iron, by E. Piwowarsky, Technical High School, Aachen, Germany. (German Exchange Paper.)

12:30 p.m.—Nonferrous Round Table Luncheon.

Chairman, E. F. Hess, Ohio Injector Co., Wadsworth, O.

12:30 p.m.—Steel Castings Round Table Luncheon.

Report of Committee on Specifications for Steel Castings.
Report of Committee on Impact Tests of Steel Castings.

1:30 p.m.—Joint Committee on Foundry Refractories.

2:30 p.m.—Refractories.

Chairman, A. V. Leun, Bethlehem Steel Co., Bethlehem, Pa.
Refractories for Electric Furnaces Producing Special Irons, by L. C. Hewitt, Laclede-Christy Clay Products Co., St. Louis.
Modern Crucible Melting Equipment, by R. H. Stone, Vesuvius Crucible Co., Swissvale, Pa.

2:30 p.m.—Pattern Making (Joint Session with Wood Industries Division, American Society of Mechanical Engineers).

Chairman, Paul Bilhuber, assistant factory manager, Steinway & Sons, Long Island, N. Y.
Modern Pattern Making Practice, by Ira B. Turner, Thomas J. Hunter Co., Philadelphia, and president of the association of Manufacturing Pattern Makers of Philadelphia district.

3:00 p.m.—Cast Iron Division Advisory Committee.

4:00 p.m.—Steel Division Advisory Committee.

4:00 p.m.—Gray Iron Shop Course.

Small Cupolas and Their Operation.
Chairman, John Grennan, University of Michigan, Ann Arbor, Mich.; dicussion leader, D. J. Reese, Whiting Corp., Harvey, Ill.

4:30 p.m.—Nonferrous Division Advisory Committee.

7:00 p.m.—Annual Banquet.

Bellevue-Stratford Hotel.
Speaker—Andrew W. Robertson, chairman, Board of Directors, Westinghouse Electric & Mfg. Co., Pittsburgh.
Presentation of J. H. Whiting Gold Medal.

Thursday, Oct. 25

9:00 a.m.—Sand Control Shop Course.

Core Sands and Binders.
Chairman, A. C. Jones, Lebanon Steel Foundry, Lebanon, Pa.; vice chairman, Frank W. Shipley, Caterpillar Tractor Co., Peoria, Ill.

(*Concluded on page* 26)

Batty, Steel Castings Development bureau, Philadelphia, and R. A. Bull, Chicago, will discuss "Porosity in Steel Castings" at the morning session on steel founding.

A symposium on "Deoxidation and Degasification of Nonferrous Casting Alloys" will be presented by four authors at the session on nonferrous founding. The symposium includes: "Introduction—Discussion of General Principles," by C. H. Lorig, Battelle Memorial institute, Columbus, O.; "Bronze Foundry Alloys," committee report, by O. W. Ellis, Ontario Research Foundation, Toronto, Canada; "Yellow Brass Casting Alloys," by L. Ward, Chase Brass & Copper Co., Waterbury, Conn.; and "Aluminum and Its Alloys," by H. J. Rowe, Aluminum Co. of America, Cleveland.

Three international exchange papers will add interest to the problems to be discussed at the Wednesday morning session on cast iron founding. The program for that meeting includes the following papers: "Breaking Strength and Physical Properties of Gray Iron," by J. Navarro-Alcacer, Valencia, Spain, (Spanish exchange paper); "Permanent Mold Castings," by Fred J. Walls, Eaton-Erb Foundry Co., Detroit; "Study of the Fluidity of Cast Iron"—report of committee of Belgian Research foundation (Belgian exchange paper); "High Chromium Cast Iron," by Garnet Phillips, Frank Foundries Corp., Moline, Ill.; and "Certainty of Results as the Basis in Manufacture of High Grade Cast Iron," by E. Piwowarsky, Technical High School, Aachen, Germany (German exchange paper).

The session on refractories on Wednesday afternoon, which is to follow a meeting of the

Program of Technical Papers For Philadelphia Meetings

(*Continued from page* 25)

10:00 a.m.—Cast Iron Founding.

Chairman, B. H. Johnson, R. D. Wood & Co., Philadelphia; vice chairman, Max Kuniansky, Lynchburg Foundry Co., Lynchburgh, Va.
Cupola High Test Cast Iron, by R. P. Lemoine, Paris, France. (Exchange Paper, French Foundry Association.)
Polishing Cast Iron for Microscopic Examination, by M. F. Surls, Michigan State College, East Lansing, Mich.
Investigation of Composition of Common Cast Iron for Boilers, by G. Sirovich and G. Vanzetti, Milan, Italy. (Italian Exchange Paper.)
Heat Treatment of Cast Iron Cylinder Liners, by W. Paul Eddy Jr., General Motors Truck Corp., Pontiac, Mich.

10:00 a.m.—Malleable Iron Founding.

Chairman, J. H. Lansing, Grand Rapids Malleable Works, Grand Rapids, Mich.; vice chairman, R. J. Teetor, Cadillac Malleable Iron Co., Cadillac, Mich.
Metallography of Ferrite in Malleable Cast Iron, by H. A. Schwartz and C. H. Junge, National Malleable and Steel Castings Co., Cleveland.
Effects of Copper in Malleable Cast Iron, by C. H. Lorig, Battelle Memorial Institute, Columbus, O., and C. S. Smith, American Brass Co., Waterbury, Conn.
Cause for the Incompatability Occasionally Found Between the Tensile Strength and Elongation of Malleable Iron Test Bars, by E. Touceda, Malleable Iron Research Institute, Albany, N. Y.
Report of Committee on Nomenclature, by W. R. Bean, Whiting Corp., Harvey, Ill.

10:00 a.m.—Steel Founding.

Chairman, John Howe Hall, Taylor Wharton Iron & Steel Co., High Bridge, N. J.; vice chairman, George Batty, Steel Castings Development Bureau, Philadelphia.
Some Aspects of the Physical Properties of Steel Making, by P. Herasymenko and E. Valenta, Skoda Works Research Institute, Pilsen Czechoslovakia. (Exchange Paper, Czechoslovakia Foundry Association.)
Steel Castings, by Dr. W. H. Hatfield, Brown-Firth Research Laboratories, Sheffield, England. (Exchange Paper, Institute of British Foundrymen.)
Report of Committee on Classification of Carbon and Alloy Steel for Castings.

12:15 p.m.—Malleable Cast Iron Round Table Luncheon.

Chairman, E. E. Griest, Chicago Railway Equipment Co., Chicago.

12:15 p.m.—Cast Iron Round Table Luncheon.

Trends in New Developments in Melting.
Chairman, E. R. Young, Climax Molybdenum Co., Chicago.

2:00 p.m.—Malleable Division Advisory Committee.

3:00 p.m.—Annual A.F.A. Business Meeting.

Chairman, President Frank J. Lanahan, Fort Pitt Malleable Iron Co., Pittsburgh.
Special Lecture by Arnold Lenz, Chevrolet Motor Co., Flint, Mich.

4:00 p.m.—Gray Iron Shop Course.

Electric Furnace Melting.

Chairman, Fred J. Walls, Eaton-Erb Foundry Co., Detroit; discussion leader, Rex Jennings, Frank Foundries Corp., Moline, Ill.

6:30 p.m.—Dinner for Instructors in Engineering and Foundry Practice and Apprentice Training.

Friday, Oct. 26

9:00 a.m.—Sand Control and Research.

Comparison of Some Methods Used in Determining the Fineness of Sands, by R. C. Hill, Cornell University, Ithaca, N. Y.
Analysis of Sea Coal as Applied to Black Sand, by R. E. Aptekar, Ypsilanti, Mich.
Flowability of Molding Sand, H. W. Dietert and F. Valtier, Harry W. Dietert Co., Detroit.
Effect of Silt on Bonding Strength of Sands, by H. Ries, Cornell University, Ithaca, N. Y.
Reports of Committees.

9:00 a.m.—Joint A.F.A. and American Society for Testing Materials Symposium on Tests and Specifications.

Chairman, H. Bornstein, Deere & Co., Moline, Ill.
Chilling Properties of Cast Iron, by W. H. Spencer, American Cast Iron Pipe Co., Birmingham, Ala.
Investigation of Test Bars, by C. M. Saeger Jr., U. S. Bureau of Standards, Washington.
Fatigue Tests of High-Strength Cast Irons, by H. F. Moore and J. J. Picco, University of Illinois, Urbana.
Horizontally Poured Test Bars, by Garnet Phillips, Frank Foundries Corp., Moline, Ill.
Testing Cast Iron, by R. S. MacPherran, Allis-Chalmers Mfg. Co., Milwaukee.
Test Bars, by J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala.

9:00 a.m.—Materials Handling.

Chairman, O. D. Conover, Consulting Engineer, Cleveland.
Selecting Foundry Equipment as an Investment, by R. J. Heissermann, Link-Belt Co., Philadelphia.
Foundry Maintenance, by James Thomson, Continental Roll & Steel Foundry Co., East Chicago, Ind.

12:30 p.m.—Special Visit to Plant of Bethlehem Steel Co., Bethlehem, Pa. Under Auspices of Philadelphia Foundrymen's Association. Trip by train.

Exhibits open daily at 9.00 a.m. to 5.30 p.m. except Thursday, when the closing hour will be 10.00 p.m.

Laird U. Park — C. Walter Yost — H. L. Henszey — B. H. Johnson

Philadelphia Committees For A. F. A. Convention

C. Walter Yost, General Chairman
Reading Iron Co., Reading, Pa.

Plant Visitation Committee

W. B. Coleman, Chairman
W. B. Coleman & Co.
G. P. Albrecht
Paxson Co.
George M. Benkert
Fairmount Foundry, Inc.
R. E. Blazo
M. A. Hanna Co.
A. W. Bowman
Schneider-Bowman Co.
Karl Dodge
Olney Foundry Co.
Robert M. Maull
Tabor Mfg. Co.
Howard Williams
N. J. Silica Sand Co.

Reception Committee

B. H. Johnson, Chairman
R. D. Wood Co.
R. M. Carrigan
Butterworth Foundry Division
Dr. G. H. Clamer
Ajax Metal Co.
G. L. Coppage
Pusey & Jones Corp.
F. B. Danehower
Ross-Tacony Crucible Co.
S. Griswold Flagg, 3rd.
Stanley G. Flagg & Co.
L. W. Harris
Link-Belt Co.
D. P. Hopkins
U. S. Pipe & Foundry Co.
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H. Brinton Co., Inc.
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Pennsylvania Railroad
Alexander Gaddess
United Gas Improvement Co.
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Philadelphia Electric Co.
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W C A U Broadcasting Co.

Ladies Reception Committee

Mrs. B. H. Johnson, Chairman
Mrs. Lee W. Harris
Mrs. W. B. Coleman
Mrs. F. M. King Jr.

T. D. Richter — Frank Devine — Earl S. Sparks — W. B. Coleman

joint committee on foundry refractories, will provide the following papers: "Refractories for Electric Furnaces Producing Special Irons," by L. C. Hewitt, Laclede-Christy Clay Products Co., St. Louis, and "Modern Crucible Melting Equipment," by R. H. Stone, The Vesuvius Crucible Co., Swissvale, Pa.

A joint session with the Wood Industries division of the American Society of Mechanical Engineers has been scheduled for Wednesday afternoon to discuss problems pertaining to patternmaking. Ira Turner, Thomas J. Hunter Co., Philadelphia and president, Association of Manufacturing Patternmakers of the Philadelphia district, will present a paper on "Modern Patternmaking Practice."

The sand control shop course on Wednesday will discuss "Sand Defects: Causes and Remedies," and the gray iron shop course will feature "Small Cupolas and Their Operation."

Banquet Marks High Point

While numerous social events are scheduled for the convention week, the annual banquet of the A. F. A. has by far the greatest appeal for the majority of convention visitors. That picturesque affair for the 1934 convention is scheduled for the Bellevue-Stratford hotel on Wednesday evening, with Andrew W. Robertson, chairman of the board of directors, Westinghouse Electric & Mfg. Co., Pittsburgh, as the principal speaker. A feature of that banquet will be the presentation of the J. H. Whiting gold medal to Arnold Lenz for his many contributions to the progress of the foundry industry. A complete announcement of this award is presented on page 38 of this issue of THE FOUNDRY.

Malleable foundrymen will find much of interest in the following papers to be presented Thursday morning at the session on malleable iron founding: "Metallography of Ferrite in Malleable Cast Iron," by H. A. Schwartz and C. H. Junge, National Malleable and Steel Castings Co., Cleveland; "Effects of Copper in Malleable Cast Iron," by C. H. Lorig, Battelle Memorial institute, Columbus, O., and C. S. Smith, American Brass Co., Waterbury, Conn.; "Remarks Covering the Cause for the Incompatability Occasionally Found Between the Tensile Strength and Elongation of Malleable Iron Test Bars," by E. Touceda, Malleable Iron Research institute, Albany, N. Y.; and "Report of Committee on Nomenclature," by W. R. Bean, Whiting Corp., Harvey, Ill. A round table luncheon on malleable cast iron will follow that session.

Feature Foreign Exchange Papers

The session on cast iron founding will feature the following papers: "Cupola High Test Cast Iron," by R. P. Lemoine, Paris, France. (French exchange paper); "Polishing Cast Iron for Microscopic Examination," by M. F. Surls, Michigan State college, East Lansing, Mich.; "Investigation of Composition of Common Cast Iron for Boilers," by G. Sirovich and G. Vanzetti, Milan, Italy (Italian exchange paper); and "Heat Treatment of Cast Iron Cylinder Liners," by W. Paul Eddy Jr., General Motors Truck Corp., Pontiac, Mich. A round table luncheon to follow the cast iron session will discuss "Trends in New Developments in Melting."

Two European exchange papers will be presented at the session on steel founding Thursday morning. "Some Aspects of the Physical Properties of Steel Making," by P. Herasymenko and E. Valenta, Skoda Works Research institute, Pilsen Czechoslovakia (*Please turn to page* 79)

Special A. F. A. Reception Committee

Members at Large

W. D. Moore, Birmingham.
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Philadelphia's new hall offers splendid facilities for the entire program

Exhibition To Show Future Trends

Developments in every field of foundry equipment and supplies to be exhibited

WHEN the formal opening ceremonies signal the time and the doors of the new exhibition hall at Philadelphia are thrown open at noon on Monday, Oct. 22, foundrymen from both America and Europe will have the privilege of inspecting and studying the latest developments in the field of foundry equipment and supplies. The exposition of the American Foundrymen's association, to be held in Philadelphia in conjunction with the annual convention of that group and the Fifth International Foundry Congress from Oct. 22 to 26, provides exceptional educational opportunities.

Since this is the first major exhibition of machines and materials under A. F. A. auspices since 1930, many manufacturers will be showing equipment and supplies at an affair of that kind for the first time. Progress during the past four years has been truly remarkable, as is revealed in the survey of developments in equipment and supplies presented on page 32 of this issue, and many of the innovations and improvements of the industry will be on display at Philadelphia. Unquestionably, these changes which have been brought about by the manufacturers of foundry equipment and supplies will affect profoundly future trends in foundry practice.

The extensive list of exhibitors, presented on pages 30 and 31 of this issue, indicate the wide diversity of products to be shown. Every type of material or machine employed in the manufacture of castings will be on display, with expert company representatives present to explain the outstanding features of design, construction or use. Since the Philadelphia hall provides complete facilities in the way of power, and additional air compressor capacity will be provided by one of the exhibitors, many of the machines will be operated during the show.

The hours during which the exhibition will be open have been arranged carefully to provide ample time for all convention visitors to inspect all of the displays in detail. On Monday the show will be open from noon until 5:30 p.m. On Tuesday and Wednesday the doors will open at 9 a.m. and close at 5:30 p.m. Thursday will be the high point in exhibition activities with

the show open from 9 a.m. until 10 p.m. Special features, of great interest to all convention visitors, are being arranged by a committee of the A. F. A., and will be announced later. Special invitations to visit the show on Thursday night have been extended to all the members of the technical societies of Philadelphia, and in addition, admission cards will be provided students in engineering in all colleges and universities in Philadelphia and vicinity. On Friday the show will remain open from 9 a.m. to 4 p.m.

Great interest will center in the displays of manufacturers of equipment for the cleaning department, since several companies have developed machines which employ entirely new principles of operation. New features in molding machine design and the combination of a number of operations in a single machine, will draw the attention of exhibition visitors. Improvements in the design and operation of various types of melting furnaces offer possibilities for more complete control of foundry operations and

Exhibitors at Philadelphia A. F. A. Show

Abrasive Industry, Cleveland.
Business and technical publications and books.

Ajax Electric Furnace Corp., Philadelphia.
Melting furnaces and refractories.

Ajax Electrothermic Corp., Trenton, N. J.
Induction furnaces.

Ajax Metal Co., Philadelphia.
Nonferrous ingot metals and babbitt metals.

American Brake Shoe & Foundry Co., Chicago.
Annealing pots.

American Foundry Equipment Co., Mishawaka, Ind.
Core machines, dust collecting equipment, sandblast equipment, sand cutters, steel abrasives, sandblast nozzles, wheelabrator equipment.

American Gum Products Co., New York.
Core binders.

Arcade Mfg. Co., Freeport, Ill.
Molding machines, vibrators, flasks, flask trimmings and jackets.

Asbury Graphite Mills, Asbury, N. J.
Graphite, foundry facings, plumbago.

C. O. Bartlett & Snow Co., Cleveland.
Conveyors and material handling equipment, core crushers, cupola chargers, dust collecting equipment, exhaust systems, sand handling and conditioning equipment.

Beardsley & Piper Co., Chicago.
Foundry mold and sand handling equipment, shakeout vibrators, foundry screens, pulverized fuel equipment, rotary melting furnaces, sandslingers.

Bethlehem Steel Co., Bethlehem, Pa.
Alloy pig irons.

Bloomsbury Graphite Co., Bloomsbury, N. J.
Foundry facings, Ceylon plumbago, plumbago blacking, Ceylon silver lead, plumbago core wash, all grades of Ceylon graphite.

Campbell-Hausfeld Co., Harrison, O.
Crucible and noncrucible melting furnaces for nonferrous alloys.

Carborundum Co., Niagara Falls, N. Y.
Grinding wheels, polishing grains, rub sticks, coated abrasives, polishing compounds, sharpening stones.

Carborundum Co., Refractory Division, Perth Amboy, N. J.
Silicon-carbide refractories, brick and tile shapes, hearths, cements, recuperators.

Chateaugay Ore & Iron Co., New York.
Pig iron and iron ore.

Chicago Mfg. & Distributing Co., Chicago.
Blow guns, conveyor and material handling equipment, flasks, chipping hammers, bull ladles, bottom plates and skimmers.

Chicago-Naugatuck Crucible Co., Naugatuck, Conn.
Crucibles and graphite specialties.

Clark Tructractor Co., Battle Creek, Mich.
Industrial tractors and trucks.

Cleveland Flux Co., Cleveland.
Partings and fluxes.

Cleveland Quarries Co., Cleveland.
Firestone refractories.

Climax Molybdenum Co., New York.
Ferroalloys.

Cling Surface Co., Buffalo.
Belt preservatives.

Combined Supply & Equipment Co., Buffalo.
Chaplets, aluminum pattern plates.

Daily Metal Trade, Cleveland.
Business and technical publications and books.

Debevoise-Anderson Co. Inc., New York, N. Y.
Foundry coke, limestone, pig iron, aluminum and alloys.

Wm. Demmler & Bros., Kewanee, Ill.
Core blowing machines.

Detroit Electric Furnace Co., Detroit
Rocking electric furnaces, ovens and castings.

H. W. Dietert Co., Detroit.
Sand testing equipment, laboratory and scientific apparatus. Also testing laboratories.

Joseph Dixon Crucible Co., Jersey City, N. J.
Graphite crucibles, graphite facings and core washes

Electro Refractories & Alloys Corp., Buffalo.
Crucibles, patching cement and refractories.

Electro Metallurgical Corp., New York.
Ferroalloys and metals.

Federal Foundry Supply Co., Cleveland.
Riddles and screens, sand testing equipment, testing machines of all kinds, sands and clays.

THE FOUNDRY, Cleveland.
Business and trade publications and technical books.

Foundry Equipment Co., Cleveland, O.
Core and mold ovens, industrial ovens, industrial furnaces.

Foxboro Co., Foxboro, Mass.
Temperature recording instruments.

Girard Smelting & Refining Co., Philadelphia.
Brass and bronze ingots, pig and bar lead, babbitts and solders.

Globe Steel Abrasive Co., Mansfield, O.
Metallic abrasives, shot and grit.

Great Lakes Foundry Sand Co., Detroit.
Sands and clays, foundry coke, refractories, metallic blast abrasives.

Harnischfeger Corp., Milwaukee.
Crawling traction cranes, cupola charging equipment.

Herman Pneumatic Machine Co., Pittsburgh.
Molding machines, core machines, shakeout equipment, timing valves and automatic fluid.

Hines Mfg. Co., Cleveland.
Foundry flasks.

Illinois Clay Products Co., Joliet, Ill.
Fire clay, fire brick, bond clay, cupola linings, insulation, refractories.

Illinois Testing Laboratories Inc., Chicago.
Testing laboratories, heat measuring instruments, air flow meters, indicating pyrometers and resistance thermometers.

International Nickel Co., New York.
Nickel alloys.

Jeffrey Mfg. Co., Columbus, O.
Portable aerator, vibrating feeders.

Johnston & Jennings Co., Cleveland.
Molding machines, vibrators and accessories.

Lancaster Iron Works Inc., Lancaster, Pa.
Castings, sand handling and conditioning equipment, sand mixers, steel plate fabrication, steel tanks, stacks.

Lava Crucible Co. of Pittsburgh, Pittsburgh.
Crucibles, graphite products and refractories.

(*Concluded on page* 31)

the displays of companies specializing in melting equipment will be an interesting feature of the exposition. Developments in heat treating furnaces and core ovens also will be shown.

Several manufacturers of sand mixing and preparing equipment have new products or valuable improvements in machines previously produced which will be shown for the first time at Philadelphia. More exacting control of foundry operations necessitates a variety of instruments for determining temperatures, testing sand, and determining the properties of the metal in the castings. Numerous types of such instruments will be exhibited.

In the field of supplies, the exhibition visitor will find exceedingly interesting and valuable information relating to pig iron, ingot metals, foundry sands, foundry facings, partings, fluxes, chaplets, coke, limestone, ferroalloys, crucibles, core oils and binders, and many other types of materials. Undoubtedly, time spent at the exhibits will prove of great value.

Exhibitors at Philadelphia A. F. A. Show

(*Concluded from page* 30)

Linde Air Products Co., New York.
Welding and cutting equipment, oxygen and acetylene.

Link-Belt Co., Chicago.
Conveyors, material and sand handling and conditioning equipment, shakeout equipment, elevator buckets, continuous molding conveyor systems, vibrating screens.

J. S. McCormick Co., Pittsburgh.
Foundry supplies, foundry facings, graphite products, plumbago, core binders, oils, compounds and paste, core washes, blowers, chaplets and nails.

Machine Design, Cleveland.
Business and technical publications and books.

Michigan Smelting & Refining Co., Detroit.
Brass and bronze ingots, aluminum and aluminum alloy ingots.

Mullite Refractories Co., Seymour, Conn.
Mullite, cement, brick and furnace linings.

Nassau Smelting & Refining Co. Inc., New York.
Nonferrous metals.

National Engineering Co., Chicago.
Conveyors, core crushers and grinders, dust collectors, material and sand handling and conditioning equipment, shakeout equipment, sand mixers, aerators, skip hoist bucket loaders.

New Jersey Silica Sand Co., Millville, N. J.
Molding sand, core sand, silica flour.

Niagara Falls Smelting & Refining Co., Buffalo.
Nonferrous alloys.

Wm. H. Nicholls Co., Richmond Hill, L. I., N. Y.
Heavy-duty molding machines.

Norton Co., Worcester, Mass.
Grinding wheels and polishing abrasives.

S. Obermayer Co., Chicago, Ill.
Foundry supplies.

Osborn Mfg. Co., Cleveland.
Molding machines, core blowing machines, tramrail systems.

Pangborn Corp., Hagerstown, Md.
Dust collectors, sandblast equipment, steel abrasives and sandblast accessories.

Paxson Co., Philadelphia.
Foundry sands, facings and supplies.

George F. Pettinos, Philadelphia.
Foundry sands, foundry facings.

Pittsburgh Crushed Steel Co., Pittsburgh.
Metallic sandblast abrasives, steel abrasives, shot and grit.

Pyrometer Instrument Co., New York.
Temperature recording instruments.

Quandt Chemical Co., San Francisco, Calif.
Core binders, oils and compounds, refractories.

Robeson Process Co., New York.
Core binders.

Royer Foundry & Machine Co., Kingston, Pa.
Sand separator and blender, shakeout equipment.

Safety First Shoe Co., Framingham, Mass.
Safety shoes.

Schramm, Inc., Westchester, Pa.
Air compressors.

Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.
Cranes and hoists, cupola chargers, monorail and tramrail systems.

Simplicity Engineering Co., Durand, Mich.
Conveyors, material handling equipment, screens and riddles, sand handling and conditioning equipment, shakeout equipment.

Sloss-Sheffield Steel & Iron Co., Birmingham, Ala.
Pig iron and foundry coke.

W. W. Sly Mfg. Co., Cleveland.
Sandblast equipment, cleaning room accessories, metal abrasives.

Werner G. Smith Co., Cleveland.
Core binders, oils and compounds.

Spencer Turbine Co., Hartford, Conn.
Cupola blowers, dust collecting equipment, vacuum cleaners.

Standard Safety Equipment Co., Chicago, Ill.
Dust protective equipment, safety clothing and equipment, sandblast equipment, safety shoes.

Standard Sand & Machine Co., Chicago.
Conveyors and material handling equipment, riddles and screens, sand handling and conditioning equipment, sand mixers.

Steel, Cleveland.
Business and technical publications and books.

Steelblast Abrasives Co., Cleveland.
Steel shot and grit.

Steel Shot & Grit Co., Amesbury, Mass.
Metallic sandblast abrasives, steel abrasives.

Sterling Grinding Wheel Co., Tiffin, O.
Grinding wheels and abrasives.

Frederic B. Stevens Inc., Detroit.
Foundry supplies, foundry facings and equipment.

Stone Pattern Mount Co., Philadelphia.
Pattern making compound.

Superior Charcoal Iron Co., Grand Rapids, Mich.
Charcoal pig iron.

Tabor Mfg. Co., Philadelphia.
Metallic abrasives, core machines, dust collecting equipment, furnaces, ovens, molding machines, sandblast equipment, tumbling mills, vibrators, cupolas.

Taggart & Co., Philadelphia.
Sand and clays.

Union Carbide Co., New York.
Welding and cutting apparatus, ferroalloys and metals.

United Compound Co., Buffalo.
Vent and pattern wax.

United States Graphite Co., Saginaw, Mich.
Graphite products.

Vanadium Corp. of America, New York.
Alloys

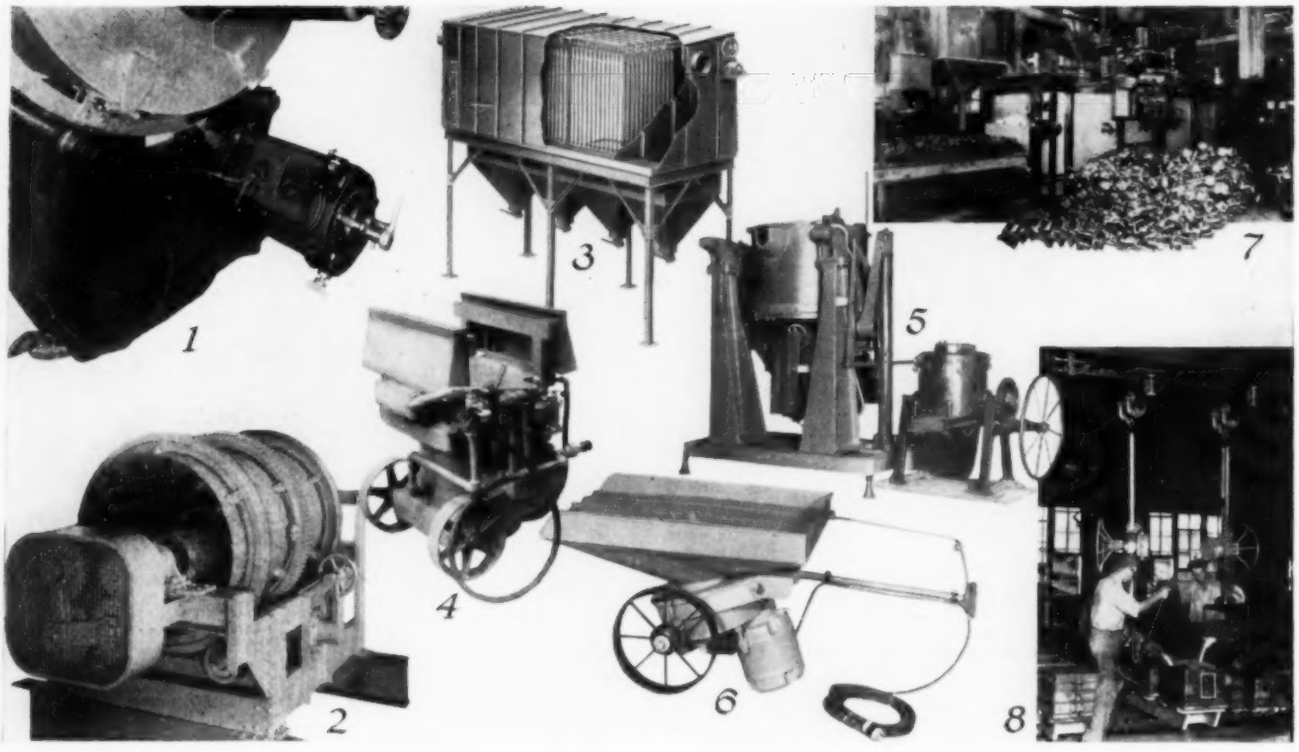
Vesuvius Crucible Co., Swissvale, Pa.
Crucibles, graphite products, refractories, stopper heads for steel pouring.

White Bros. Smelting Corp., Philadelphia.
Brass and bronze ingot metals, casting copper, nonferrous alloys.

Whitehead Bros. Co., New York.
Foundry sands, clays, gravels, foundry facings, core binders and supplies.

Whiting Corp., Harvey, Ill.
Buckets, cranes and hoists, cupola chargers, dust collectors, exhaust systems, melting furnaces, ovens, coal pulverizers, tumbling mils, annealing ovens, cupolas, ladles, stokers.

Yale & Towne Mfg Co., Philadephia.
Chain blocks, electric chain hoists, overhead cranes, electrical industrial trucks and tractors.



Equipment Furthers Foundry Progress

Recent innovations in machinery and materials give close control of practice and product

By FRANK G. STEINEBACH

REMARKABLE developments in products, processes and equipment during the past four years have established the foundry industry in the strongest position of its long and exceedingly useful existence in the service of mankind. New products produced by the casting process have been made possible through efforts of many companies in providing funds for individual research. New processes have been developed and new equipment and supplies are available to perform the particular work more efficiently than ever before. Competition with other forms of fabrication has been intensified as castings manufacturers have pushed on to recapture old markets and to establish supremacy of their products in fields where previously it was not considered possible to produce castings with properties sufficiently high to meet the exacting demands of service. Today, as never before, industry as a whole is looking to the foundry industry as an important supplier of a wide variety of satisfactory semifinished and finished materials.

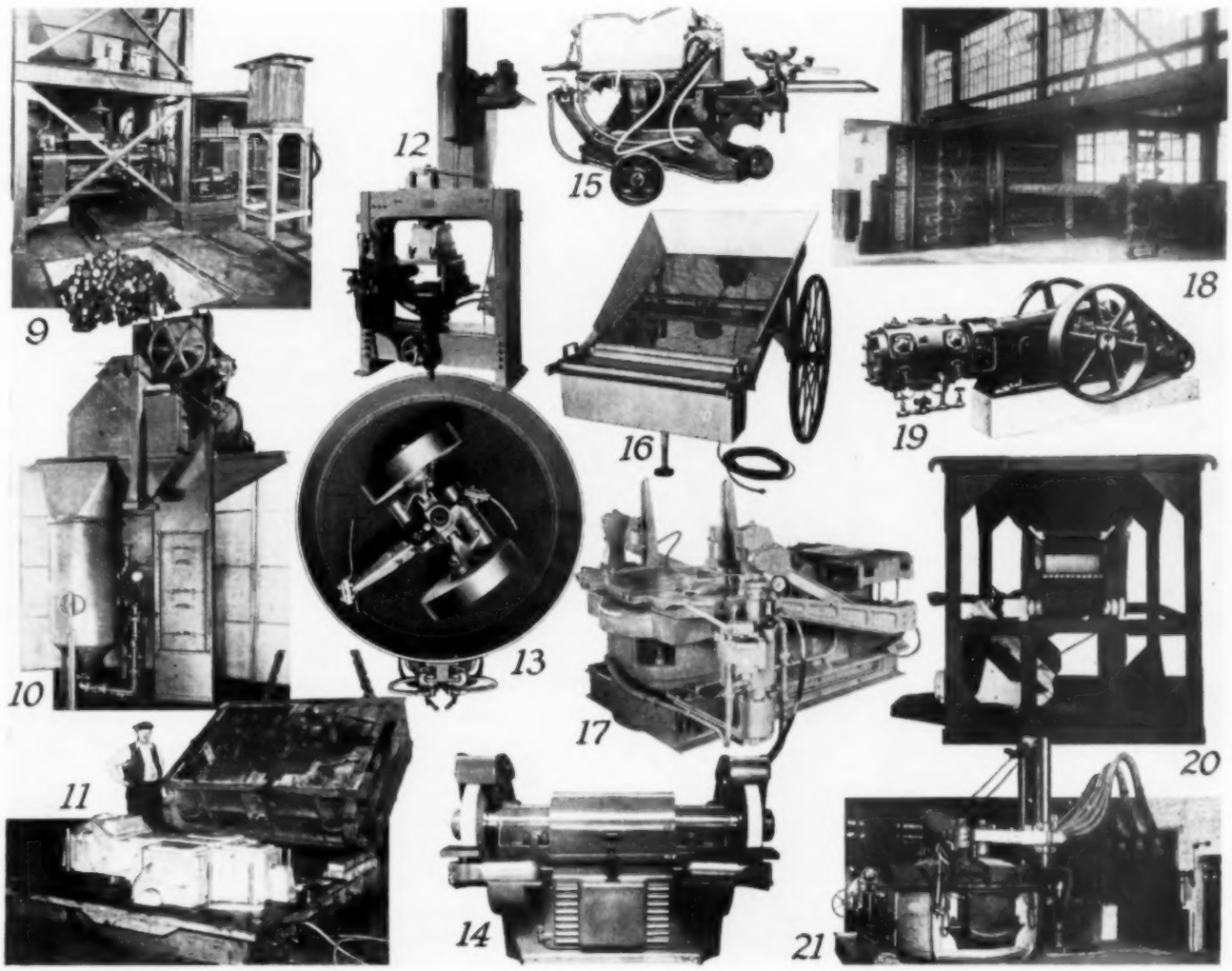
Much of the progress in castings manufacture may be traced directly to the benefits which foundries have secured through a wide variety of developments in foundry equipment and supplies. While during the past 40 or 50 years those companies classified in either the foundry equipment or the foundry supply industries have kept in step with the foundry industry, chiefly through inventive genius and the willingness to devote time and money to the creation of machines and materials which have made possible mass production and a greatly improved product, probably the most remarkable progress has been made during the past 4 years. That period, which covers the greater portion of one of the major depressions in the history of our country,

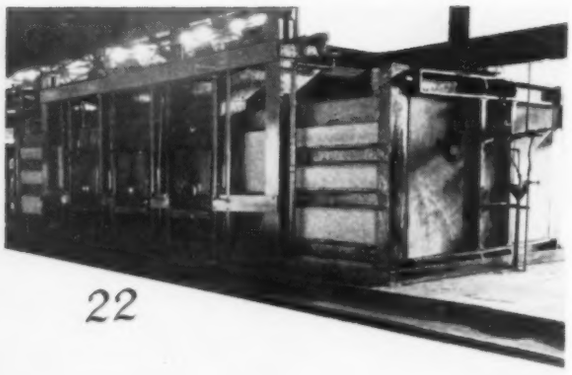
has been conducive to new ideas and new practices despite the discouragement of general industrial conditions.

Realizing the unusual interest among foundrymen at this time in all that is new, more efficient or more economical in foundry operation, THE FOUNDRY has surveyed the field of developments in machines and materials during the past 4 years. Results of this study are striking for they point out clearly the wide diversification of accomplishment. Progress has not been confined to any one particular field, but rather has been intensified in furthering economical operations in every department of the modern foundry. Unquestionably, the innovations and improvements introduced during the years of depressed industrial activity will have the tendency to change future practices.

A digest of the enormous amount of valuable information collected in this survey is presented on the following pages. While the limited space available will not permit a discussion of the complete details and important features of each development, readers will find additional information in the advertising pages of this or succeeding issues of THE FOUNDRY, and in many instances the equipment described will be on display at the exposition of foundry equipment and supplies in Philadelphia, Oct. 22 to 26. A key to the illustrations presented with this article, which gives the type of equipment and manufacturer, is presented on page 93 of this issue of THE FOUNDRY.

New principles of operation have originated in the field of cleaning room equipment. American Foundry Equipment Co., Mishawaka, Ind., has introduced an airless abrasive cleaning method in which a mechanical device handles the abrasive material and mechanically throws it against the work to be cleaned. Abrasive is fed by gravity from a central storage hopper into the mechanical device, the method employing centrifugal, tangential and air-dynamic forces. The mechanical cleaning device may be applied to the tumbling type blasting unit as well as the table and room types. That company also has developed a continuous type dust arrester which is built in units. Continuous operation is accomplished by cutting out one unit and reversing it while the remainder of the units are cleaning the dust laden air. The action is entirely automatic, being controlled by a valve which throws out the unit, reverses the air stream and shakes the screens when enough dust accumulates on the screens to cause a predetermined difference in pressure between the





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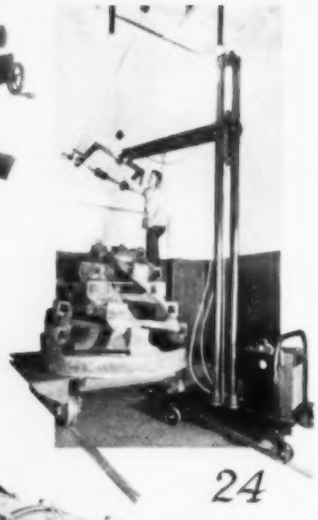

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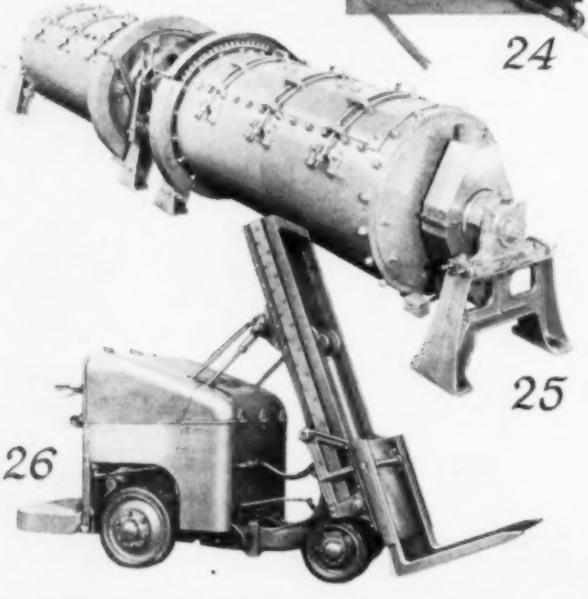

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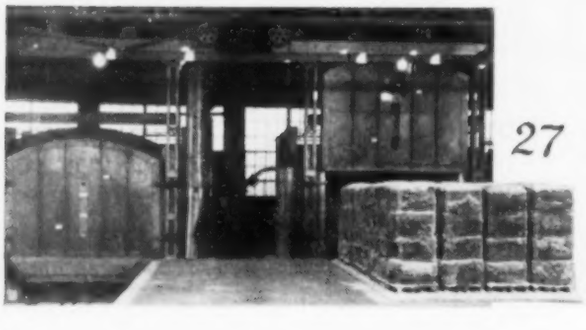

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clean air and the dust laden air in the two sides of the arrester.

W. W. Sly Co., Cleveland, has incorporated a new design in a barrel type machine for cleaning castings by both tumbling and abrasion. The unit is self contained with the abrader equipment built into the machine, and requires only electrical connections and a pipe outlet to the dust collectors. The machine recovers the molding and core sands and returns the abrasive to the abrader unit without the use of an elevator. That company also has developed a new line of tumbling mills which feature the use of roller bearings throughout, improved barrel construction to provide longer life and to prevent warpage under severe duty, worm gear speed reducer in the drive system, changes in method of exhausting and a new door design. A pneumatic abrasive separator, also designed by that company, removes coarse refuse and fines, which have no abrasive value, and returns the usable material to the blast tank. In that unit, abrasive and other materials removed from work are elevated and passed through a revolving screen which removes the coarse refuse. The material then is passed over two curved sheds and air is drawn through to remove the fines.

Cuts Down Cost of Power

Antifriction bearings have been added to its line of tumbling mills by the Whiting Corp., Harvey, Ill., to reduce the power required for operation. That company also has introduced a tube type dust filter, consisting of a large number of small filter units in the form of tubes which are easily accessible for cleaning. The flow of air is from the inside of the tube to the outside.

A new tumbling mill of N. Ransohoff, Inc., eliminates manual handling of stars and other tumbling material, and employs a side loading barrel with a central tumbling section and two end sections for receiving the separated stars. In loading, the stars are placed in the end sections and the work packed in the central portion. Rotating the barrel in the tumbling direction conducts all of the stars into the tumbling section and distributes them throughout the work. Reversal of the drum automatically returns the stars to the two end sections. The barrel may be used for either dry or wet tumbling. That company also has completed a continuous type washing unit for cleaning metal parts.

Borium blasting nozzles, which are said to last for 300 hours of sandblasting operation, have been introduced by the Great Lakes Foundry Sand Co., Detroit. Each nozzle consists of two parts, an outer shell of mild steel and a borium insert. Another product employed in blasting is a new helmet introduced by the Pangborn Corp., Hagerstown, Md. The helmet incorporates numerous safety features, and provides a continuous stream of cool, deodorized washed

air which is regulated to satisfy the personal breathing requirements of the wearer. Special care has been taken to prevent the seepage of dust into the helmet. The window is held in an air tight grip by a rubber tire and draw strings which fit the interior cape to the neck.

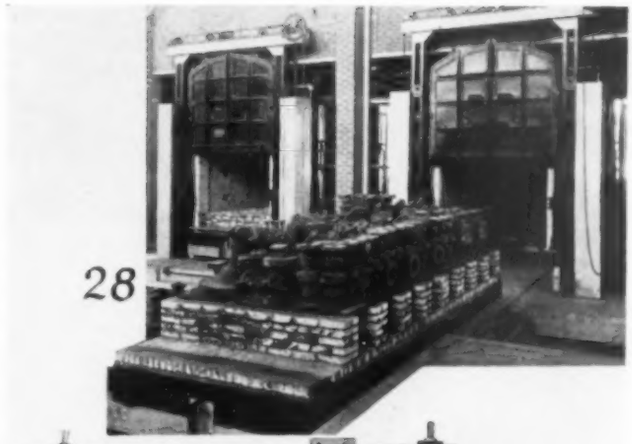
A wide variety of grinding machines for numerous foundry uses have been made available to the industry. N. A. Strand & Co., Chicago, has made several changes in design of its flexible shafts and portable flexible shaft machines, and has introduced several new machines both in the vertical and horizontal types. Ball type bearings have been made standard equipment on all machines. The old type of countershaft having an overslung frame has been changed to a more rigid design having an underslung frame. Semiprotection for the belt drive on the countershaft is obtained by attaching a substantial guard over the driven pulleys. Changes also have been made in the design of the flexible shafts to provide greater strength in both casing and core.

Grinding Wheel Speeds Vary

Buckeye Portable Tool Co., Dayton, O., has introduced three new high-frequency electric grinders for the foundry industry. One unit weighing 16 pounds has a speed of 3800 revolutions per minute with an 8-inch elastic bonded wheel. A second type has the same general construction but operates at 5400 revolutions per minute, using a 6-inch elastic bonded wheel. A third unit is a cup wheel grinder operating at 3600 revolutions per minute. Special features include a cable which may be replaced quickly, and bakelite insulating pads between the stator and housing to keep the heat of the stator from reaching the housing.

United States Electrical Tool Co., Cincinnati, has developed several new grinders including an adjustable speed, alternating current grinder for vitrified and high-speed wheels. The grinders are equipped with a special gear drive transmission. Two models of this design are provided with four speeds to maintain efficient grinding throughout the life of the wheel. The speed change is accomplished by depressing the foot pedal which automatically opens the motor circuit, and moves the hand lever on the front of the machine to the desired speed. The upper portion of the wheel guard is adjustable to wear of the grinding wheels and is interlocked with the speed control mechanism to prevent the operator from overspeeding the grinding wheels.

A lightweight, high production portable tool suitable for grinding, sanding, polishing and wire brushing has been developed by the Ingersoll-Rand Co., New York. The machine has two handles so that the operator can hold it at right angles to the working surface. One handle can be removed to facilitate working at close quar-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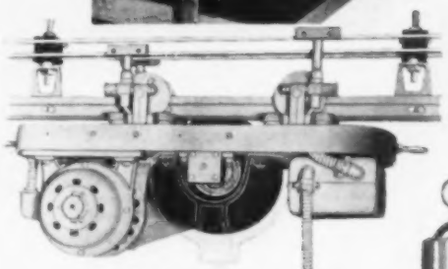
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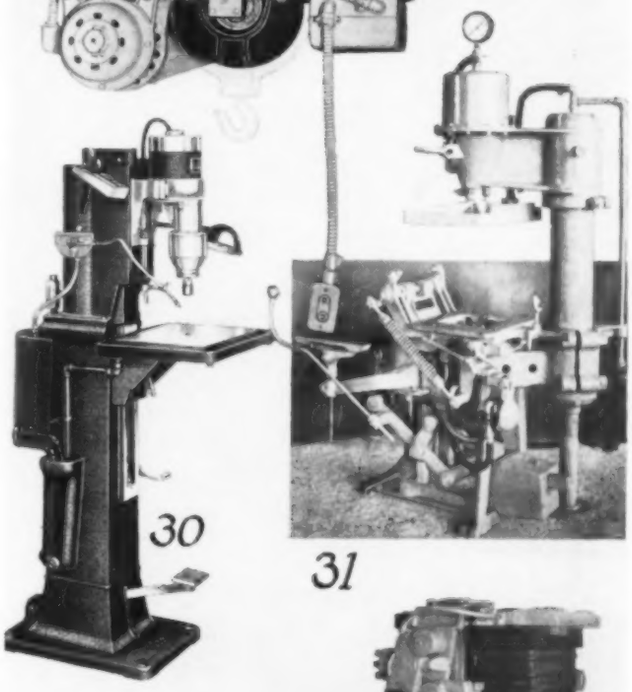
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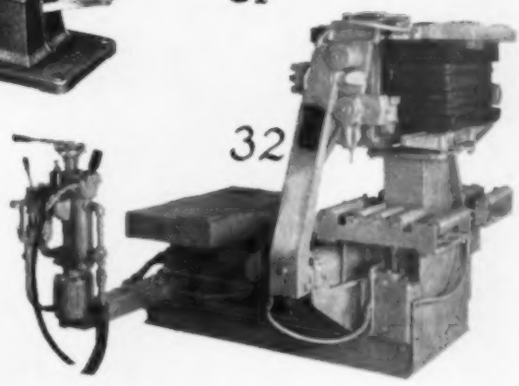
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ters. The second handle acts as an air inlet and contains a thumb controlled throttle valve. The standard free speed is 4600 revolutions per minute. That company also has introduced a chipping hammer designed especially to do fast cutting.

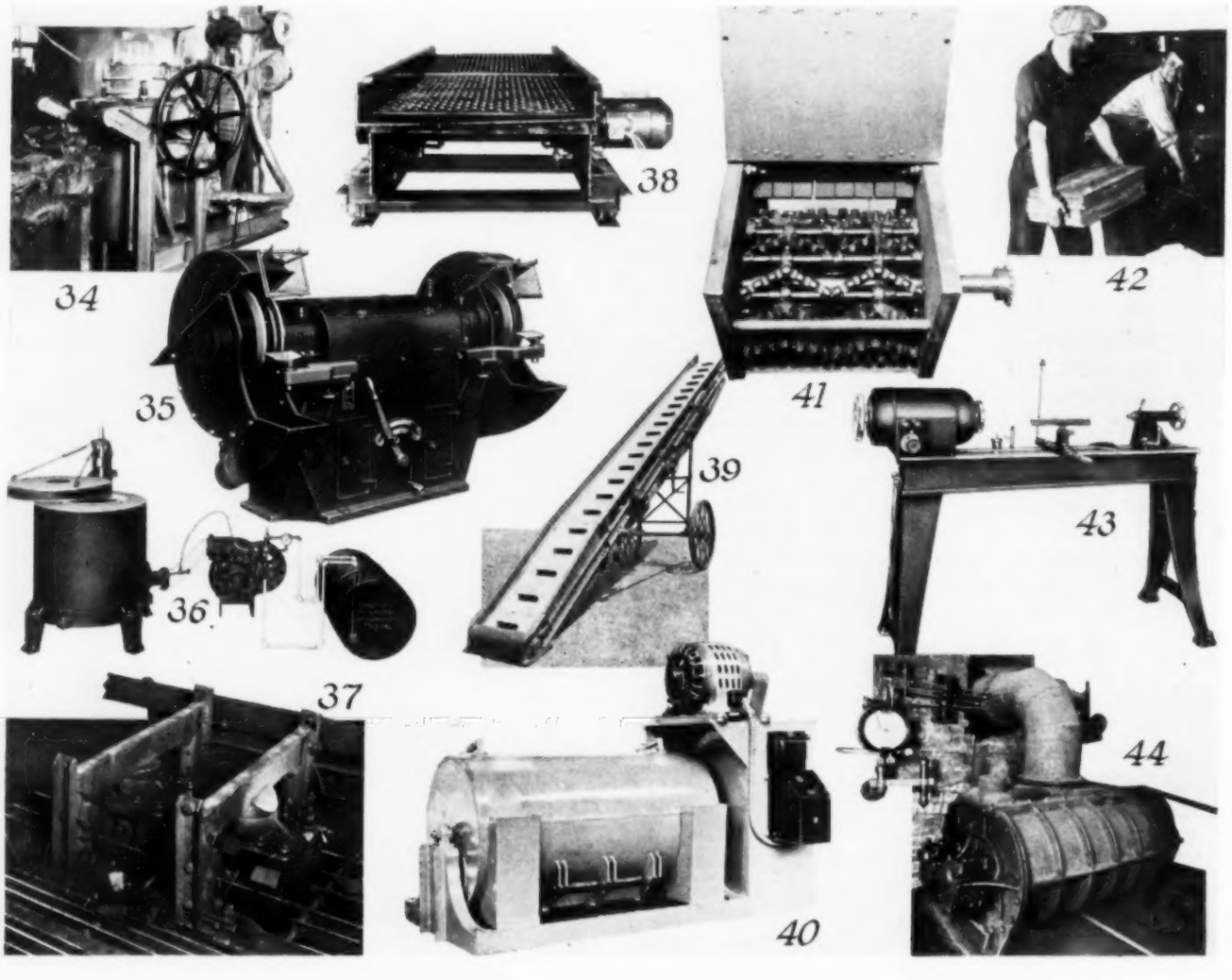
Use of a cone-shaped grinding wheel is featured in a portable unit produced by the Rotor Air Tool Co., Cleveland. The grinder has a speed of 10,000 revolutions per minute with a cone-shaped wheel 2¾ inches in diameter. It is claimed the high speed gives maximum cutting action so that the small diameter wheels may be used effectively for grinding fillets, radii and irregular surfaces of castings.

Provision Made for Wheel Wear

A new high-speed floor grinder for use with bakelite bonded wheels is a development of the Bridgeport Safety Emery Wheel Co., Bridgeport, Conn. Wheels with large holes are used, and 3-speed changes at regular intervals produce a maximum wheel surface speed of 9500 feet per minute and a minimum surface speed of 8000 feet per minute. The wheel is used from 24 inches in diameter to 15-inches in diameter, leaving stubs with only 15 inches in diameter and having a 12-inch hole. The speed change is governed automatically by the diameter of the largest grinding wheel. Mechanism for changing the speed is interlocking, so that it is impossible to speed the largest wheel faster than 9500 surface feet per minute. A feature of the machine is the use of an individual spindle for each machine, the spindles being coupled together and driven from a common sheave on the right-hand spindle.

Independent speed control for each grinding wheel is a feature of a heavy-duty, snagging grinder introduced by the Hisey-Wolf Machine Co., Cincinnati. The grinder is manufactured for 20, 24 and 30-inch grinding wheels, either high-speed or vitrified, with spindle speeds to correspond. A high-speed rotary air grinder designed to operate cone-shaped grinding wheels has been developed by the Independent Pneumatic Tool Co., Chicago. The grinder operates at 10,000 revolutions per minute and uses cone wheels measuring 2¾ inches outside diameter.

In addition to several types of portable grinders, the Standard Electrical Tool Co., Cincinnati, has designed a motor-driven exhaust unit which may be mounted on heavy-duty grinders and buffers. An exhaust unit with a ¾-horsepower motor running at 2600 revolutions per minute is mounted on the back of the pedestal. The motor-driven unit is fitted with a dust collect-



ing bag which keeps air clean in the vicinity.

Exacting control of melting, baking and annealing operations should be facilitated greatly through progress in the design of various types of furnaces and ovens. In the field of electric furnace melting, the Detroit Electric Furnace Co., Detroit, has introduced a special safety switch which supplements the present reversing switch on its indirect arc, rocking type furnace, automatically preventing the furnace from going beyond the safe limit of rock and also providing a more positive and auxiliary pouring control. A gearhead magnetic brake motor interlocks with the limit switch. Improvements have been made in the construction of the furnace shell and a new type of door which is operated by a crank through a worm and gear also has been introduced. The company recently designed a new rocking type furnace of 25 to 100 pounds capacity for production or experimental melting of small runs of iron, alloy steel, copper, brass, nickel, aluminum, and precious metals, and for the melting of alloys to be added in the ladle to cupola melted iron. Basic principles and method of operation are the same as in the larger type.

To decrease the time interval between heats and to reduce the number of men needed on the furnace crew, the Pittsburgh Lectromelt Furnace Corp., Pittsburgh, has designed a direct arc type electric furnace with a swing-aside roof. The roof of the furnace is supported on a heavy lifting cylinder which is stationary and separate from the furnace shell. The movement which lifts the roof and swings it aside is produced by a ram from the stationary cylinder. Oil pressure for operating the lifting mechanism is supplied by a motor-driven pressure pump. With the roof swung aside, the charge may be placed in the furnace by a drop-bottom bucket. That company also has introduced a 25-pound capacity furnace for special work in melting, refining or alloying iron and steel, melting ferroalloys and nonferrous metals and alloys, and for special investigation. The roof and electrodes of this small furnace may be tilted back by a lever mechanism to facilitate charging. The small furnace occupies little floor space.

Furnace Capacity Is Increased

It is interesting to note the increase in capacity which has been provided in the induction type furnaces of the Ajax Electric Furnace Corp., Philadelphia. The original 30-kilowatt unit built by that company had a maximum pouring capacity of approximately 300 pounds while a new unit of recent design may pour a heat of from 3200 to 3500 pounds. Linings now are available for melting all red brass and bronze alloys, and several satisfactory heats have been obtained on copper. Investigations now are being conducted on the melting of steel and cast iron in a 3 to 4-ton furnace. Ajax Electrothermic Corp., Trenton, N. J., has made improvements in structural details of its high-frequency, or coreless induction furnaces, such as moving the tilting trunnions from the furnace box to the supporting stand strengthening (*Please turn to page* 85)

Arnold Lenz Is Awarded Gold Medal by A.F.A.

ARNOLD LENZ, prominently identified with the motor castings industry for many years and responsible for many improvements and innovations in foundry technique and operation, will be the recipient this year of the J. H. Whiting medal. In recognition of outstanding service, Mr. Lenz has been designated by the board of awards of the American Foundrymen's association and presentation will be made at the annual convention of the association held in Philadelphia the week of Oct. 22-26.

The honor is particularly in harmony with the general atmosphere of the fifth international foundry congress attended by representatives of many foreign foundrymens associations. The recipient at the age of 18 emigrated from Germany and through hard work, perseverance and innate ability steadily advanced through many stages to his present position, assistant manufacturing manager in charge of Flint, Bay City and Saginaw, Mich., plants of the Chevrolet Motor Co.

Mr. Lenz was born May 10, 1888 in Hauingen, Germany where he attended public school. At the age of 14 he entered the office of the firm Sarasin, Staehelin & Co., Haagen, and as an apprentice attended a technical night school during this four year apprenticeship period. In 1906 he emigrated to the United States. With a view to preparing himself for the opportunities he felt confident would present themselves, he spent the first two years working his way through two terms at the New York State normal school, Fredonia, N. Y.

To familiarize himself with the details of American foundry practice he worked for varying periods as molder, coremaker and melter in several Ohio foundries, including the Browning Foundry Co., Ravenna and Alliance Brass & Bronze Co., Alliance. His first foreman's job was with the Ryder Brass Foundry Co., Bucyrus, O. His next position was that of assistant foundry foreman with the American Clay Machinery Co., the same city. He then moved to Cleveland to fill the position of assistant manager of the American Range & Foundry Co.

Sensing the possibilities and future opportunities in the automobile castings branch of the foundry industry he secured a position as instructor in the foundry of the Buick Motor Co., Flint, Mich., in May, 1916. Ability in this position was recognized by rapid promotion to general foundry foreman and assistant superintendent in the same year. In January, 1919 he accepted a position as assistant to the manager of the Aluminum Castings Co., Detroit, but returned to the General Motors Corp., the following May in the capacity of superintendent of the gray iron foundry of what then was known as the Saginaw Products Co., and which was under construction. The plant now is the gray iron foundry of the Chevrolet Motor Co.

He became manager of the plant in 1922 and in 1925 was promoted to the position of assistant general manager in charge of the gray iron and malleable foundries of the company. In 1927 the gray iron foundry was taken over by the Chevrolet Motor Co. At the beginning of 1932, he became assistant manufacturing manager of Chevrolet with headquarters in Flint where he is ranking plant executive of that branch of the organization.

Mr. Lenz has taken an active part in the work of the American Foundrymen's association and was elected a member of the board of directors at the Chicago convention 1929.

In 1926 he was selected by the A.F.A. to present the annual exchange paper at the convention of the Institute of British Foundrymen. Through training and experience he was particularly well qualified to present to the foundry world the established fact that repetition work does not imply any sacrifice of quality.

Federal building, electrical group and east tower of the sky ride, Chicago Century of Progress, at night

Tour Leading Foundry Centers

American foundrymen extend courtesies to European visitors in preconvention journey

ONE outstanding attraction for European engineers and manufacturers in planning a visit to America is the opportunity to visit and study industrial plants. The same motive inspires many who have the opportunity to travel abroad and a busman's holiday, holding the promise of a chance to visit castings plants and to talk with operating men always inspires interest among foundrymen. No trade, or craft, or industry is more imbued with the trait of scientific interest or common curiosity, than that which impells foundrymen when the smell of hot core oil fills the air.

Realizing this interest, a preconvention tour for European foundrymen has been arranged to cover the period from Oct. 11 until the opening of the Fifth International Foundry Congress and Exhibition in Philadelphia Oct. 22. The itinerary of the tour covers many of the large eastern foundry centers, selected for their interest from a castings manufacturing standpoint and as extensive as is permitted in the time allotted to the overseas visitors. The party, numbering more than 50, and including 14 ladies, will number distinguished representatives of the foundry industry and business and technical leaders from Great Britain, Belgium, Czechoslovakia, France, Spain, Germany and Italy.

The party will arrive in Buffalo Friday morning, Oct. 12 where they will be greeted by a committee consisting of H. D. Miles, chairman and Peter J. Krentz, Buffalo Foundry & Machine Co.; J. H. Pohlman, Pohlman Foundry Co.; B. T. Hain, American Radiator Co.; N. K. B. Patch, Lumen Bearing Co.; Keith Williams, Pratt & Letchworth Co.; F. W. Carter, Fillmore Foundry, Inc.; R. E. Dillon, Lake Erie Engineering Corp.; E. J. Schwanhauser, Worthington Pump & Machinery Corp.; F. D. Bowman, Carborundum Co., Niagara Falls; H. M. Richardson, and J. P. Comer, Dobbie Foundry Co., Niagara Falls. Following a morning of plant visitation, the party will be given a luncheon at the Statler hotel, a special bus trip to Niagara Falls to be followed by a view of the Falls illuminated and dinner prior to the return to Buffalo for the night train to Chicago.

The Chicago committee which will greet the party consists of the following: David Evans, Chicago Steel Foundry Co., chairman; W. C.

Packard, Standard Sand & Macnine Co., secretary; V. E. Minich, American Foundry Equipment Co.; James Thomson, Continental Roll & Foundry Co., E. Chicago, Ind.; R. S. Hammond, Whiting Corp., Harvey, Ill.; G. B. Stantial, Illinois Malleable Iron Co.; W. G. Gude, Penton Publishing Co.; H. S. Simpson, National Engineering Co.; W. H. Parker, American Steel Foundries; C. C. Kawin, Charles C. Kawin Co.; J. J. Boland, Griffin Wheel Co.; C. B. Magrath, Northwestern Foundry Co.; J. R. Allan, International Harvester Co.; E. O. Beardsley, Beardsley & Piper Co.; and R. D. Phelps, Francis & Nygren Foundry Co.

Following a tour of the city and main points of interest including the Rosenwald museum of science and industry, the party will return to the Hotel Knickerbocker for lunch. A managed tour of the Century of Progress will be followed by a dinner in the Trustees' lounge of the fair, where President Rufus G. Dawes will extend greeting to the overseas party and their hosts, the foundrymen of Chicago. No plans for entertainment are scheduled for Sunday.

Trip to Milwaukee Is Offered

Monday is left free for plant visitation with a number of attractive establishments made available to groups of the party that may elect to journey to Milwaukee. Milwaukee foundrymen including W. J. Grede, Liberty Foundry, Inc., Wauwatosa, Wis.; R. S. MacPherran, Allis Chalmers Mfg. Co. will assist in the entertaining.

Arrival in Detroit, Tuesday, Oct. 16, will be followed by a motor coach tour of points of interest. Plant visitation, under direction of the Detroit foundry committee will be followed by a dinner at the Detroit Golf Club. The Detroit committee consists of the following: Fred Erb, Eaton-Erb Foundry Co., chairman; Vaughn Reid, City Pattern Works; S. Wells Utley, Detroit Steel Casting Co.; W. H. Joseph Cluff, Frederic B. Stevens Co.; W. J. Muhlitner, Great Lakes Foundry Sand Co.; J. D. Stoddard, Detroit Testing Laboratory; Frank H. Dodge, Werner G. Smith Co.; Harry Rayner, Dodge Brothers; Harry J. Deutsch, Aluminum Co. of America; Frank X. Mushynski, American Car & Foundry Co.; Ira F. Cheney, Griffin Wheel Co.; Fred J. Walls, Eaton-Erb Foundry Co.; James L. Mahon, American Car & Foundry Co. Wednesday will be devoted to plant inspection, with courtesies extended by various plants in Saginaw, Flint and Vassar, Mich., following which the overseas party will leave by lake steamer for Cleveland.

Visit Plants in Cleveland

An entire day devoted to plant visitation has been arranged in Cleveland for Thursday, Oct. 18, with the local committee tendering a luncheon to the European foundrymen and their ladies. Special courtesies are extended by the National Dairy show to such as may desire to inspect its exhibition which will be under way in the public auditorium. The party will depart after dinner for Pittsburgh. The Cleveland committee is made up of the following: Ralph H. West, West Steel Casting Co., Chairman; Frank G. Steinebach, THE FOUNDRY, secretary; R. F. Lincoln, Osborn Mfg. Co.; M. G. Tielke, Crucible Steel Casting Co.; H. A. Schwartz, National Malleable & Steel Castings Co.; A. J. Tuscany, Gray Iron Founders Association; Robert E. Belt, Malleable Founders Society; J. F. Froggett, Penton Publishing Co.; T. J. Calhoun, Johnston & Jennings Co.; W. L. Seelbach, Forest City Foundries Co.; George R. Miller, Superior Foundry Co.; H. C. McDaniels, Hill Clutch Machine & Foundry Co.; Henry J. Trenkamp, Ohio Foundry Co.; James Mitchell, Cleveland Co-Operative Stove Co.; William Greenbaum, Acme Foundry Corp.; A. C. Denison, Fulton Foundry & Machine Co.; J. L. Battenfeld, Johnston & Jennings Co.; J. H. Bruce, Bowler Foundry Co.; B. R. Pearse, Atlas Foundry Co.; C. M. Bolich, Nickel Plate Foundry Co.; R. E. Williams, Chicago Pneumatic Tool Co.; C. J. Schluederberg,

The overseas visitors will land in New York, and will start the American pre-convention tour from there. This view of the metropolitan sky line was taken from Central park

Westinghouse Electric & Mfg. Co.; Fred S. Wellman, Wellman Bronze & Aluminum Co.; W. F. Muth, National Bronze & Aluminum Foundry Co. D. J. Gluntz, Gluntz Brass & Aluminum Foundry Co.; Bert Harsch, John Harsch Bronze & Foundry So.; Kent Van Horn, Aluminum Co. of America; J. H. Redhead, Lake City Malleable Co.; Walter L. Woody, and C. C. Gibbs, National Malleable & Steel Castings Co.; M. C. Rosenfeld, Grabler Mfg. Co.; J. E. O'Brien, J. R. Raible and Grief Raible, Fanner Mfg. Co.; Homer Tielke, and Max Tielke, Crucible Steel Casting Co.; Ralph R. West, J. McKenzie and David Lansdowne, West Steel Casting Co.; John W. Carpenter and F. C. Kindler, Otis Steel Co.; John D. Wise, Foundry Equipment Manufacturers Association; S. C. Vessy, W. W. Sly Mfg. Co.; M. W. Zeman, Osborn Mfg. Co.; C. A. Barnett, Foundry Equipment Co.; L. P. Robinson, Werner G. Smith Co.; B. J. Fuller, Whitehead Bros. Co.; H. L. McKinnon, C. O. Bartlett & Snow Co.; Ray Moore, Whiting Corp.; Ralph Ditty, Federal Foundry Supply Co.; H. M. Boylston, Case School of Applied Science.

Terminal tower in Cleveland, and the Hotel Cleveland on the right where the guests will be received

In the Steel City, plant visitation has been arranged to fill the entire day, Friday, Oct. 19. A dinner will be held at which the party will be the guests of the Pittsburgh foundrymen. The committee consists of the following members of the Pittsburgh foundrymen: Thomas A. Reynolds, McConway & Torley Corp., chairman; Walter Buske, McConway & Torley Corp.; Charles Dobson, Carborundum Co.; Alfred W. Protheroe, Vesuvius Crucible Co.; Clarence Fisher, Advance Pattern Co.; L. J. Kelly, Fort Pitt Malleable Iron Co.; A. E. Day, Mesta Machine Co.; George H. Zoerb, Sharpsburg Foundry Co.; S. B. Cuthbert, Carnegie Steel Co.; H. P. Spilker, Sterrit-Thomas Foundry Co.; C. T. Daniels, Mackintosh - Hemphill Co.; Walter H. White, Pittsburgh Rolls Corp.; C. E. Davis, Homestead Valve Mfg. Co., Coraopilis; A. M. Onderyco, Westinghouse Air Brake Co.; C. H. Paul, Mackintosh - Hemphill Co.

Daylight ride to Washington, leaving Pittsburgh at 9:30 a.m., Saturday, will bring the party to the Capital City in the early evening. Sunday and Monday will feature special motor coach trips covering the public buildings and points of interest and including a trip to Alexandria, the National Cemetery and Mt. Vernon. Monday evening the party will arrive in Philadelphia to attend the convention and exhibition. While in Philadelphia, the overseas party will make their headquarters at the Benjamin Franklin hotel. At the formal opening of the convention, Tuesday morning, the representatives of the various countries will be welcomed by the American Foundrymen's association and by those speaking for the convention city. Plans are being made for a reception for the entire party and their ladies, Tuesday night, at the Franklin institute, where members of the American Foundrymen's association and the Philadelphia committee will have an opportunity to meet and become acquainted with their European guests. The reception, to start at 8:30 in Franklin Memorial Hall, will include a demonstration of equipment for moving picture and sound reproduction, an inspection of permanent exhibits, a special lecture demonstration in the Planetarium and refreshments.

Following visits to many interesting plants in Detroit, the party will go by boat to Cleveland

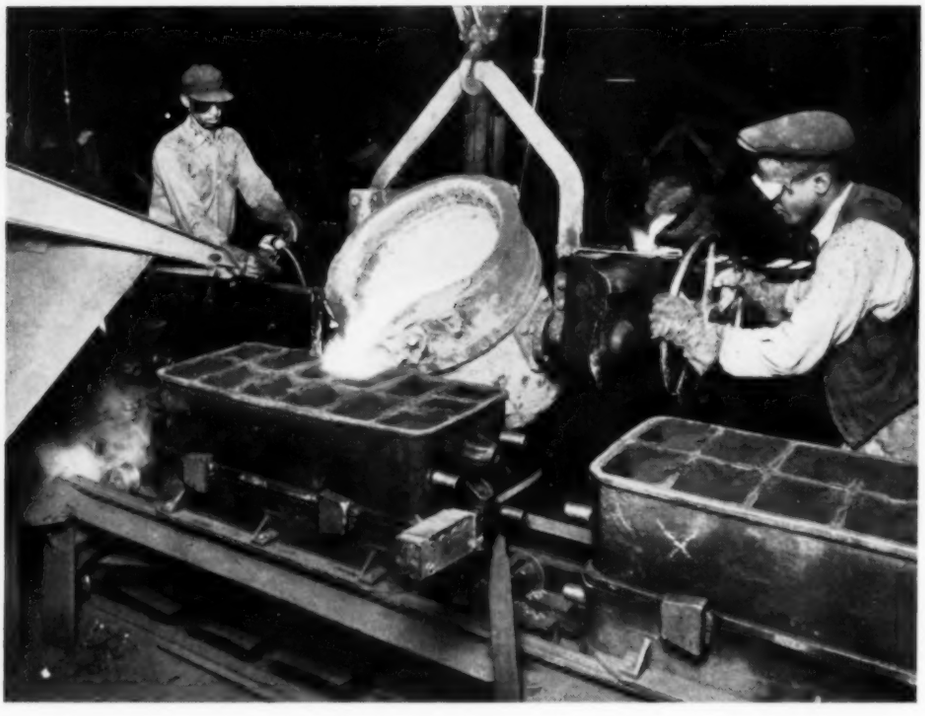


Fig. 1—Operator at the left steadies the ladle and controls the hoist

Foundry Melts 2000 Tons a Day

Over a period of 15 years the production has increased steadily to present peak

By PAT DWYER

ONE of the reasons a prophet is without honor in his own country, is that in such a distressingly large number of instances the prophecies so confidently predicted, fail to materialize. When the General Motors Corp. erected a $3,000,000 gray iron foundry in Saginaw, Mich., in 1919, the self constituted prophets wagged a figurative beard and an impressive forefinger. In their single and collective opinion, a foundry capable of melting 200 tons of iron a day and employing 900 men, was not and never would be necessary in the automotive industry.

A year later the manager of the plant presented a paper before a meeting of the National Founders association in which the methods and equipment were described. He told also his reasons for adopting these methods and why he favored certain types of mechanical equipment and rejected others. He saw no necessity for installing either mold or sand conveyors. By erecting and operating his molding machines in the center of each floor he laid down a floor of molds on either side alternately. Thus he had a free space on one side while the molds on the opposite side were poured, shaken out and the sand reconditioned and kicked up to the vicinity of the molding machine. Metal was melted and distributed continuously throughout the ordinary working day. In his well considered opinion the situation was well in hand and the existing setup would take care of future requirements satisfactorily.

As a foundry manager he established an enviable record in quality, tonnage and cost of castings. As a prophet he was not so good. This is not to his discredit, since nothing short of a super prophet could have foreseen the immense expansion of this unit of the General Motors Corp. activities within a comparatively short period. It is idle of course, but yet to a certain extent interesting to speculate on what course of action he would have pursued in scrapping

all existing ideas and in developing a technique to meet the constantly increasing demand for larger and larger production. Death snatched him away before he was confronted with this problem and the solution was transferred to the capable hands of his former assistant and later successor Arnold Lenz. In 1924, the foundry was absorbed by the Chevrolet Motor Co. and since has been known as the Chevrolet Gray Iron Foundry. Since the elevation of Mr. Lenz to the position of assistant manufacturing manager of the Chevrolet Motor Co. early in 1932, the plant has been managed by James Miller, appointed assistant manager in 1929, who carries on the policy of improving equipment, methods and quality as a continuous program.

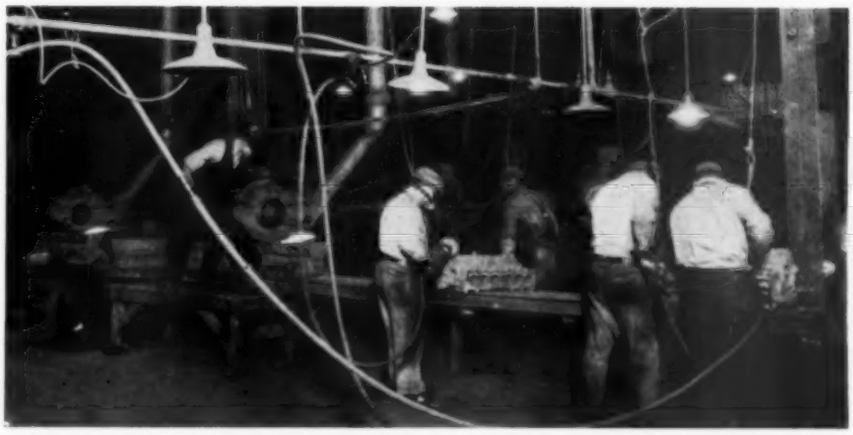


Fig. 3—Typical section in cleaning room where cylinders are ground

Magnitude of this program readily will be appreciated from the succinct statement that the amount of metal melted daily has risen from 200 to 2000 tons. On one peak occasion recently a total volume of 2200 tons of iron was melted in one day in the battery of cupolas and—less gates sprues and scrap—was converted into castings for Chevrolet cars. Since the weight of the castings is approximately 75 per cent of the weight of iron charged in the cupolas, and since the average weight of gray iron castings in a car is 482 pounds, simple calculation shows that 2200 tons of iron will produce castings for 6846.4 cars. Carrying the calculation a trifle further and basing it on the practically universal 20 day month now observed in industry, the monthly output of castings would be sufficient for 136,920 cars or 1,643,040 over a yearly period.

Although the foundry is an important unit in the group of plants operated by the General Motors Corp., it has to stand strictly upon its own feet in open competition with the foundry industry in general. The castings are made and shipped to Chevrolet's gear and axle plant, Detroit, its engine plant in Flint, its transmission plant in Toledo, and its carburetion plant in Bay City.

The plant occupies space on a 65-acre property bounded on the western side by the Saginaw river which flows north about 15 miles to Saginaw Bay, the indentation which separates the thumb from the remainder of the mitten on the map of Michigan. During the past few years advantage has been taken of this waterway for importation of the greater part of the raw materials used in the foundry, including pig iron, scrap, coal, sand and limestone. Since most of this material is contracted for on a yearly basis and since the river is open for navigation only 6 months of the year, it is apparent that an immense volume of material is handled on the dock during this curtailed period.

Fig. 2—Pig molds mounted on trunnions receive left over iron

The river was dredged to a depth of 22 feet and widened in the vicinity of the dock for a turning basin. The dock itself 720 feet in length, is reinforced concrete supported on piles driven closely together and penetrating to a strata of solid material 40 feet below the surface. The ground immediately back of the dock and designed for the storage of great mounds of pig iron, had to be treated in a similar manner to prevent the superimposed weight from pushing the dock wall into the river.

Two gantry cranes unload the vessels into railroad cars or upon the storage docks, pig iron and scrap with magnets and other materials with grab buckets. The loaded cars are

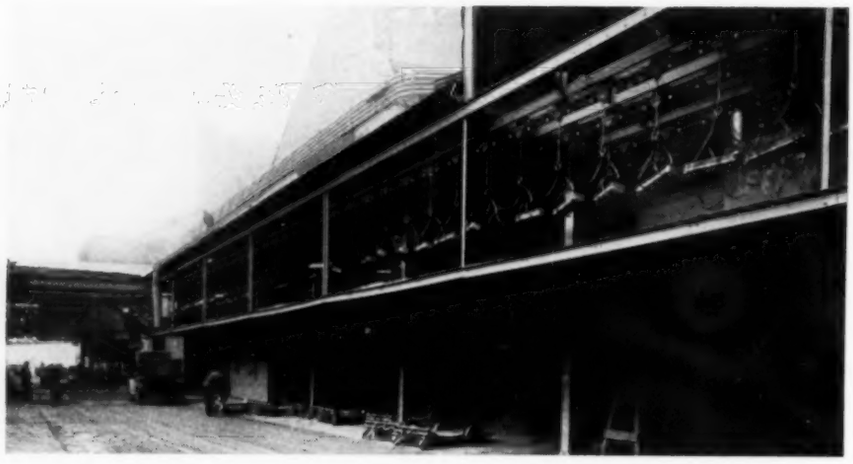


Fig. 4—Cylinder heads and blocks are cooled on aerial conveyors

shunted to designated points and unloaded with a locomotive crane, or taken directly to the foundry where facilities are provided for storing an immense amount of material. Pig iron in various grades, scrap iron and steel scrap are handled by two traveling cranes which span two sections of the foundry storage yard, one on either side and with the runways extending to the charging platforms behind each battery of cupolas. Electrically operated car pullers spot the coke cars over a chute which leads to an underground chamber. The coke falls into a hopper provided with an automatic gate. A car attached to a cable on an inclined elevator receives the coke in measured amounts.

Coke Is Measured and Weighed

When the empty car comes to rest at the bottom of the elevator an electric contact opens the gate and the coke flows into the car. When the car is loaded the gate automatically closes and the loaded car travels to the top of the incline where the load is discharged through a screen on to a traveling belt. The screen has three divisions. Coke breeze falls through the first division and is diverted to a hopper from which it is taken later and used for fuel. Coke less than 2 inches in size falls into a second hopper from which it is taken to fire the core ovens. The remainder moves forward on the belt and is discharged into hoppers above the coke and limestone side of the charging platform. Details in connection with charging the cupolas will be discussed later. The two batteries of cupolas are handled as individual units, but the single coke apparatus serves both batteries.

Sand is stored in two buildings, one at the northeast and one at the southeast corner of the main group of plant buildings. The Chevrolet foundry really is a double foundry, made up of two duplicate units side by side which may be operated singly or together. Each unit is self contained with sand supply and distribution systems, melting, molding, shakeout, coremaking and drying equipment. Detail of these various activities, also description of the cleaning department which serves both units will be taken up later. The present description merely covers some of the general features and is designed to familiarize the reader, to some extent, with the general layout, the extended scale of operation, and other more or less interesting features essential to the successful functioning of a manufacturing plant of such outstanding magnitude.

Approximately 50,000 tons of fine, sharp sand sucked up from the bottom of Saginaw Bay enter into the annual production of dry sand cores. With the exception of a small quantity of new molding sand employed in reviving the sand heaps in the aluminum foundry, no new molding sand is imported for general foundry use. A synthetic sand based on a former waste product is employed exclusively and with highly gratifying results. Briefly, all the waste core and molding sand is reclaimed and reconditioned.

Initial steps in this program were instituted several years ago by installing a water tank, a pump and pipe line. Castings containing dry sand cores are shaken out over gratings in the floor. The sand falls on to a belt which discharges it into the water tank. A stream of water flowing into the tank keeps the mass in constant motion. The pump draws the sand impregnated water from the tank and discharges it through a long pipe line leading (*Please turn to page* 96)

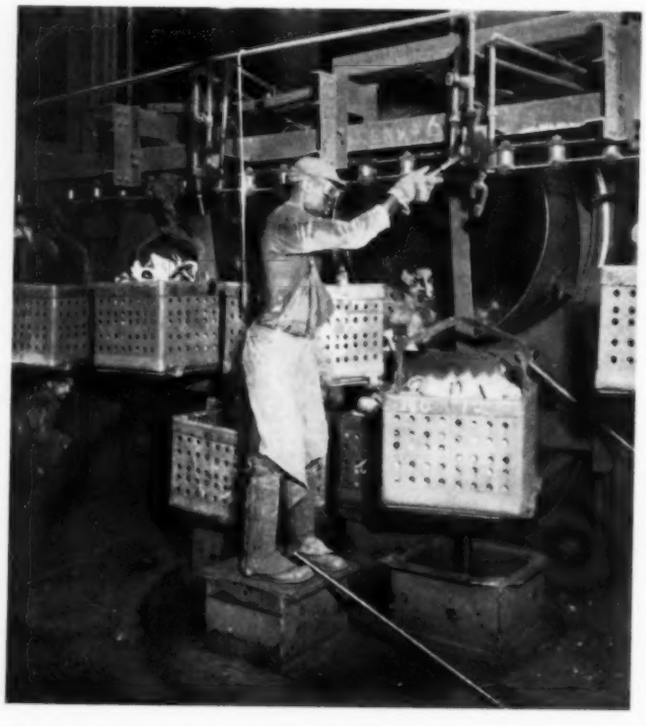


Fig. 5—Pistons from the shakeout fall into steel boxes on a turntable. Each loaded box in turn is lifted and attached to a conveyor

Gray Iron Foundry Cost System

Code authority and administration approve uniform costing and estimating methods

A UNIFORM cost and estimating system for the gray iron foundry industry recently has been approved by the code authority and the administrator of the NRA.

With respect to an alleged violation of Subsection I of Section I of Article VI of the Gray Iron foundry industry code, defense against such allegation may be based on any recognized cost accounting system which includes all the elements of cost included in the approved uniform cost and estimating system, provided the percentage of the sum of non-variable indirect costs included in total cost shall not be less than that percentage as determined by the approved system, and provided further that the total sum of direct costs and variable indirect costs is included in the total cost. If, in any individual case, the percentage—as determined by the system—clearly is inequitable due to special circumstances, a different method of determining the percentage may be employed, subject to the approval by the division of research and planning of the National Recovery administration.

The code of fair competition for the gray iron foundry industry includes a provision that it shall be a violation of the code to sell or offer to sell any products or services below the cost of such products or services, as determined by cost accounting methods approved by the code authority and the administrator. The purpose of establishing standard cost procedure for the industry is to provide all members with a means of figuring their individual costs for the purpose of establishing selling prices in conformity with the code; and to provide a means of checking violations of the code provision against selling below cost which will be fair and equitable to all concerned. The cost accounting procedure outlined in this cost system has been approved by the code authority and by the administrator.

In preparing this cost procedure, due consideration has been given to the fact that it should be flexible enough to meet the varying requirements of both large and small foundries. The standard procedure outlined herein embodies the best cost accounting practice now in use among progressive gray iron foundries and is recommended as a standard practice for the industry. The simplified procedure is designed to meet the needs of the smaller foundries, and represents the simplest possible procedure whereby costs, which are approximately accurate, can be obtained. The basic cost methods in both procedures are the same.

I. General Procedure for Determination of Cost:

1. Divide cost into at least the minimum number of cost divisions and cost accounts specified in the simplified procedure.
2. Record and charge to its proper cost account every item of the total cost of conducting the business, with the exception of the items specifically listed as nonoperating items.
3. Make up a record of the total charges to each cost account for the preceding period of a year or at least 6 months, and from this record figure departmental costs and overhead rates according to one of the methods outlined in either the simplified or standard procedures; and refigure and adjust departmental costs and overhead rates whenever there is a material change in wage rates, material prices, or overhead expenses. It is recommended that a period of one year be used, to allow for variations due to seasonal requirements or changes in the class of work; also that departmental costs and overhead rates be refigured and adjusted quarterly on the basis of the four quarters immediately preceding the date of adjustment. Where cost records covering the preceding 6 months or year are not available, members will be permitted to use departmental costs and overhead rates based on the preceding 3 months' period until records for a 6 months' period have been accumulated.
4. Use the departmental costs and overhead rates as determined in figuring all costs and figure all costs in accordance with one of the methods outlined in either the simplified or standard procedure.
5. Make up a cost estimate, on a form similar to the cost estimate form shown in Fig. 1, on every job before quoting, and place this on file so that it can be produced in case of complaint. (*Please turn to page* 99)

Use Plaster for Foundry Patterns

Method of gating a tablet depends to some extent on the shape and total area

SEVERAL methods are employed in gating tablets and other castings of the same general character. The method adopted in any given instance depends to some extent on the size and shape of the casting and to some extent on the available rigging. For example it would be idle to attempt casting a large tablet on edge if a rigid iron flask and facilities for drying the mold were not available.

The minimum amount of metal is required where the mold is made in the usual manner and then turned up on edge to receive the metal. A row of thin gates at the joint conduct the metal from a long, narrow pouring basin or reservoir into the mold cavity. The principal advantage of the method is that gravity assists the metal to fill every part of the mold and eliminates cold shuts. Manifestly only a hard, dry mold encased in a rigid iron or steel flask will withstand the pressure of molten metal introduced in this manner. A prominent art foundry in Chicago has practiced this method for many years.

However, the general practice is to cast tablets in a horizontal position either in green or in skindried molds. Iron flasks are to be preferred, but satisfactory castings are made in wood flasks properly braced. With the exception of small tablets, the castings are gated at both sides and at both ends. Where the expanse is exceptionally wide small supplementary pop gates are placed over the central area to insure that sufficient metal reaches that portion.

Usually four crucibles are employed and the method is quite feasible where a sufficient number of men are present. In some instances it may be advisable or necessary to arrange a set of gates to be fed from a single pouring basin. This is particularly applicable when pouring high zinc mixtures where the casting in color and appearance must match extruded metal sections in the vicinity. Where the metal is poured from a single large ladle into a pouring basin the hazard of zinc smoke entering the mold is greatly minimized.

In Vol. XXXVII, *Transactions* of the American Foundrymen's association, H. J. Roast covered several salient features in connection with the foregoing in describing the casting of a large bronze door 3½ x 13 feet, ¼-inch thickness of metal and with five panels. The mold was made in an iron flask and tilted about 2 inches to the foot. Even with this rigid flask some trouble was experienced by the mold cracking during handling. The trouble was minimized to some extent by making separations in the mold following the lines of the panels.

The mold was poured from five reservoirs in which the metal was released simultaneously. Plugs in the reservoirs were 2 inches in diameter with sprues leading to the runners and with gates leading from the runners directly into the center of each panel. The first reservoirs were spaced about 18 inches apart with gates extending down to the plate and with additional sprues extending down to feed gates in each of the five panels. The sprues were 1¼ x 2 inches and the gates leading into the mold were ¼ x 2 inches.

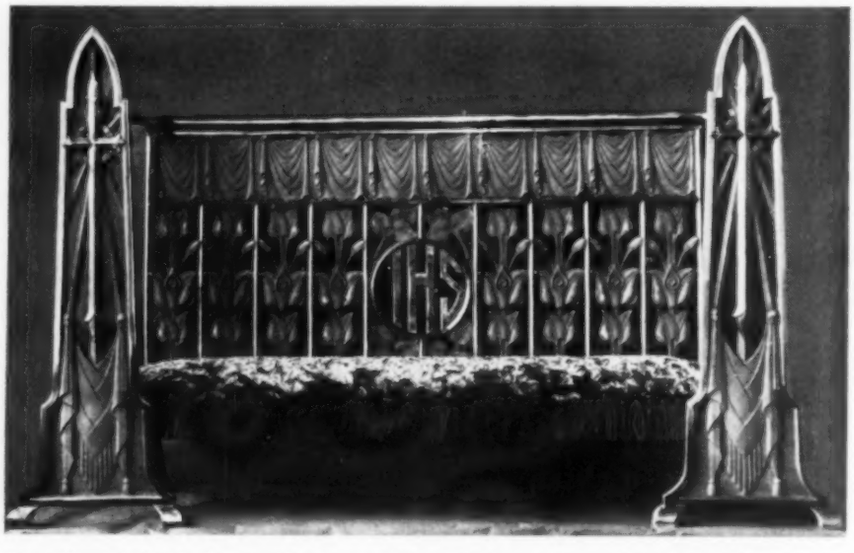


Fig. 10—Original clay model for a single panel was reproduced in eight plaster duplicates which then were assembled to form the back pattern for the aluminum alloy prie-dieu

Sufficient metal was provided to prevent any dross from entering the sprues at the close of pouring.

To prevent the mold from straining, the cope was covered with perforated steel plates held down by three steel rails anchored at the ends. Five I-beams rested on the rails at right angles with the ends attached by bolts to similar beams under the bottom of the flask.

The door had to match a framework of extruded metal and apparently called for a formula of copper 80 per cent, zinc 16.5 per cent, tin 3 per cent and possibly lead 0.5 per cent. Anticipating trouble from the large percentage of zinc, this metal was cut to 10 per cent and the other constituents adjusted in proportion. The resulting color was quite satisfactory. Part of the metal was melted in an electric furnace and the remainder in crucibles. It was taken from the furnaces at a temperature of 2350 degrees Fahr., and poured at a temperature of 2150 degrees Fahr.

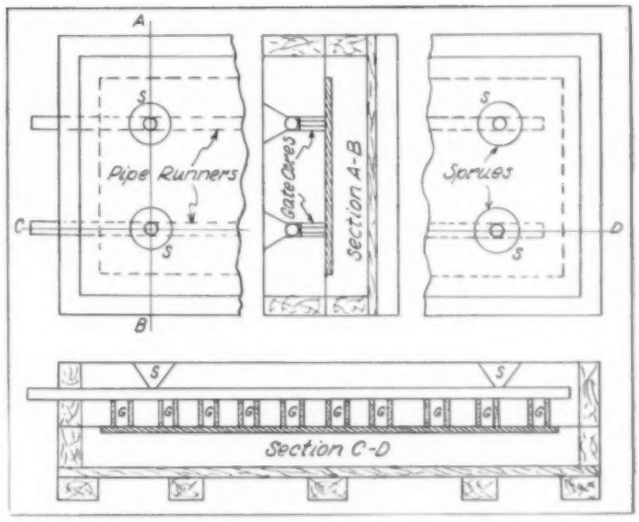


Fig. 11—Plan and sectional views of the gating method employed on large tablets. Small cores take the place of wood wedge gates employed in some instances

Use Number of Small Gates

A somewhat elaborate, but highly satisfactory method of gating large bronze tablets—and of course the method also is applicable to castings in other metals—is illustrated in Fig. 11. The casting is molded horizontally face down in the usual manner and gated on the back through two, three or more rows of small wedge gates. The number depends on the total area of the casting. Small wedges 1½ x 1½ inches, ¼-inch thick at the top tapered to 1/16-inch at the bottom are placed in straight rows on the pattern 8 or 10 inches apart and a thickness of sand is rammed around them to hold them in place. A length of 1-inch pipe is laid horizontally on top of each row of wedges and partly covered with rammed sand. The pipes then are lifted out temporarily to permit removal of the wedges. The pipes are returned to place and an upright runner placed on each and if necessary slanted to a common runner so that the entire set of runners may be served from one basin in which the sprue is plugged until the basin is filled with metal. After the cope is rammed the pipes are pulled through holes in the end of the flask and the holes plugged with short pieces of stock core.

In the illustration a minor change has been effected by substituting small dry sand cores containing the gate openings for the wedge gates. In this method the pipes remain in place throughout the entire ramming of the cope and eliminate any possible minor hazard of crushing or of small particles of sand getting into the gates.

Where the mold is gated at the sides or ends, a set gate is preferable to one cut or formed with a gate cutter. In a general way this applies to the gates for any casting. A channel in the sand formed by ramming sand against a pattern is bound to be smoother, firmer and more uniform in cross section, than a free hand gate cut with a bent piece of tin, copper or brass sheet, even if the latter gate is slicked with a tool or smoothed down with the more or less skillful thumb of the molder. In recent years the skilled thumbs are not as numerous as formerly, even if—as superintendents complain occasionally—the thumbs seem to be present in undue proportion to the number of fingers.

A simple and highly effective type of gate and runner for small tablets and other thin castings is shown in Fig. 13. Two half cores *K* with the sprue, runner and gate cavities formed in opposing surfaces are pasted face to face. The completed core is placed upright upon the center of the cope face of the tablet pattern and the remainder of the cope is filled with sand and rammed in the usual manner. After the cope is lifted off any loose sand that may be present is removed from the gate passage with a bellows or a jet of compressed air.

Artist Designs and Makes Pattern

The design, original model and working pattern for the beautiful prie-dieu shown in Fig. 10 were conceived and executed by the Fischer & Jirouch Co., Cleveland for a prominent undertaker who wanted a distinctive piece of furniture of this kind as part of his professional equipment. Beyond the general approximate dimensions and the fact that the completed unit must be collapsible for transportation, he had no suggestions to offer. The artist designer decided upon aluminum as the most suitable metal for the purpose of carrying out the ecclesiastical, religious and mourning motif. Through connections discreetly concealed from the public gaze, the two upright members, the curved back and the bench supporting the cushion readily may be attached or detached.

After the drawing has been approved and accepted by the customer several methods are available for the construction of the pattern for

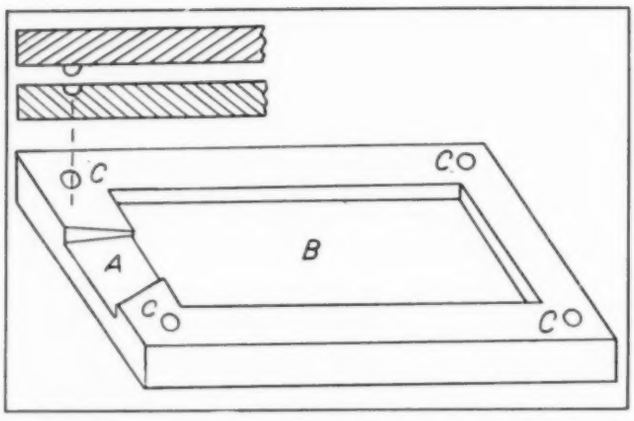


Fig. 12—Typical plaster mold showing the gate A, the mold cavity B and the guides C for locating one part on the other

a casting typified by the back panel in the illustration Fig. 10.

In the first method the entire panel is modeled in clay on a flat board. A shallow frame is placed around the model and filled with plaster. This plaster cast is a negative and after it has been cleaned and oiled it is filled with plaster to form the positive or in other words a plaster replica of the clay model. The plaster is approximately 2 inches thick and extends beyond the pattern proper for several inches on all four sides to form the joint of the mold and to serve as bearing under the thickness strips which support the drag as shown in Fig. 4. (THE FOUNDRY for September.) In the foundry the mold then is made in the manner formerly described.

Work in Studio Is Divided

Since the clay modeler is the most highly paid operator in a studio it is customary wherever possible to reduce his work to a minimum and delegate part of the work to the caster, a man skilled in his own line but whose remuneration is on a lower scale. For example on the panel shown in Fig. 10, a casting in which the ornamental figure is repeated, the modeler would construct a single clay figure for the conventional leaf design and another for one of the funeral drapes shown above each of the leaf figures.

The caster places a shallow wood frame around the clay pattern and fills the frame with plaster. This frame corresponds to the drag in ordinary foundry practice. It is rolled over. Another frame is placed on top and filled with plaster to form the cope. The cope and drag are separated, the clay is removed from the drag and then the mold is reassembled and filled with plaster as many times as may be necessary to form the required number of ornamental units.

The horizontal rail at the top and the triangular vertical members are swept on a flat board with a strickle working between suitable guides as shown in Fig. 8. Pieces of this kind are swept to any convenient approximate length and then cut to the proper length after they have solidified. The pieces then are assembled in place.

When the required number of pieces have been made they are assembled on a board in their proper relative position. They may be retouched here and there and minor inequalities repaired with liquid plaster. The entire surface then is brushed with stearic acid, oil, or other parting medium and a plaster negative cast as in the first instance. From this point onward, the procedure is similar to that already described.

Under certain conditions where a foundryman makes the patterns in his own shop he may find it more convenient to use wax than plaster for reproducing ornamental detail on the pattern. Other materials manipulated in a liquid form which rapidly assume a hard and stone like rigidity and smooth surface, also are available. Sources of supply for these various materials may be had by consulting the advertising pages of THE FOUNDRY.

Upper Surfaces Strickled Flat

Where the detail piece is flat on one side, the plaster negative or drag may be treated as an open sand mold. No cope or cover is required. The liquid plaster is spilled into one mold and the upper surface is strickled flat. However, in some instances the piece may be curved or present an irregular contour necessitating the use of a cope. Keys or dowels are formed on the joint faces of cope and drag as shown in Fig. 12 to locate these parts in their proper relative positions each time they are assembled.

The recesses *C* may be formed either by placing a suitable knob or projection on the face of the original model, or, by cutting them in the plaster face with a suitable tool after the negative has been rolled over. They may be cut to any desired shape or size. The semispherical male and female dowel shown at *C* in Fig. 12 is suitable in the majority of instances. They are placed at any convenient points on the joint surface and since the cope plaster is cast on top of the drag, it is apparent that the parts will register accurately each time they are brought together afterward.

Since this mold is to (*Please turn to Page* 104)

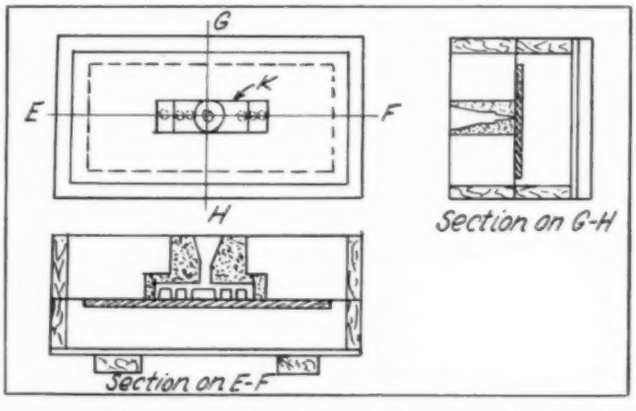


Fig. 13—Plan and sectional views of small tablet mold in which the metal is poured through a core in the cope

Short Cycle Anneal for Malleable

Tests reveal method which may be followed to reduce time with same furnace equipment

By GOTTFRID OLSON

DEMAND on malleable foundries for quicker delivery has brought about a change in equipment in the annealing departments of many shops. The reason for this demand being made on the malleable industry may be many-fold but no doubt one contributing factor is the earlier reports of results obtained in laboratory furnaces. One such report gave the over-all time as ranging between 8 and 13 hours. The tensile strength from 56,600 to 74,400 pounds per square inch, and the elongation from 3½ to 5½ per cent with the exception of two bars that gave 8½ and 10 per cent respectively. This iron is not a commercial malleable iron but is referred to only as a matter of record. A true malleable iron should give higher figure for elongation; 15 to 18 per cent in 2 inches, the latter figure being the one adopted for the *Symposium on Malleable Iron Castings.*

It was only to be expected that investigators should try to develop the idea further. The first report of practical result concerned an electric furnace of 1½ ton capacity where castings were annealed in 27 to 29 hours. The furnace was described in THE FOUNDRY for Oct. 1, 1929.

It has been stated frequently that short anneal malleable iron is inferior to long anneal, in that its tensile strength is lower and the elongation less. The author believes that short anneal malleable can be made as good as regular malleable. It is no longer a guess as to what happens at certain temperatures and therefore no doubt should exist in the minds of foundrymen as to the time required for annealing. It is all a matter of temperature and time.

Investigations show that the absorption of Fe_3C into solid solution requires: 3 hours at 1832 degrees Fahr., 10 hours at 1742 degrees Fahr., and 30 hours at 1652 degrees Fahr. As is the case of absorption, precipitation is dependent on time and temperature. No appreciable amount of precipitation takes place above 1500 degrees Fahr. and maximum is reached around 1365 degrees.

Shortening the annealing cycle is simply a matter of temperature control. Annealing is accomplished in four stages; the first being that of heating of the castings to annealing temperature, the second, the first or primary stage of graphitization, the third, cooling down to about 1400 degrees, and the fourth, the second stage of graphitization. The two periods of graphitization also are called soaking periods. It has been the practice in the past to allow from 7 to 10 days for annealing. This has in a good many plants been reduced considerably without going the full way in what has become known as short anneal.

To shorten the time of annealing two things must be determined; first, which of the four periods may be shortened, second, how much can the time be reduced without injury to the product? As to the first stage, no time limit need be figured. The only restriction on speed at which temperature may be raised is the one caused by uneven temperature, some of the

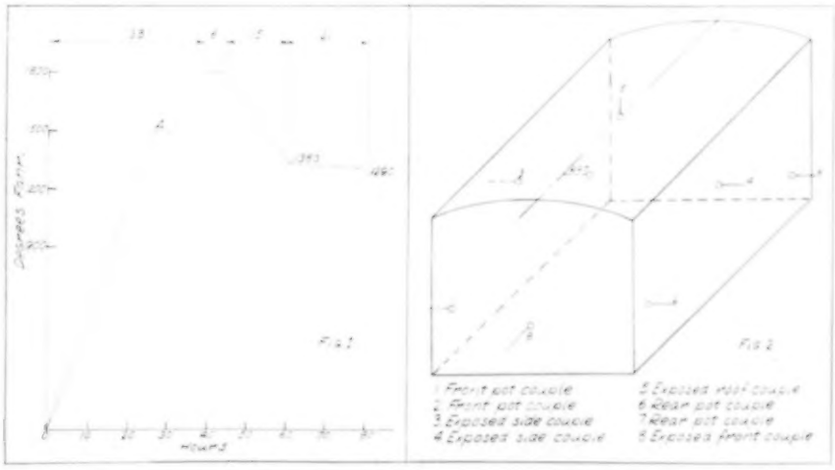


Fig. 1 (Left)—Theoretical diagram of the annealing cycle. Fig. 2 (Right)—Location of pyrometers in the oven

pyrometers lagging. Referring to Fig. 1 it may be necessary to stop firing at *A* to allow heat to soak through. For a small oven, 5-7 tons, the time required is usually 6 hours. Four pyrometers are used, one in each corner, to check and record the temperature. Two more are placed in other parts of the oven to check for cold or hot spots, as shown in Fig. 2.

If at *A* the difference between the four corner stacks is less than 50 degrees Fahr. it may be considered safe to keep on firing provided, as the temperature increases, the difference between the four corner stacks decreases. When the temperature approaches 1800 degrees Fahr., the difference between the couples should not be more than 10 to 15 degrees. A difference of 25 degrees at this high temperature invariably will produce a material quite different in physical properties. However, this does not mean that the castings will not fall within the range of standard specifications for tensile strength and elongation. The question of impact test has not been given enough consideration.

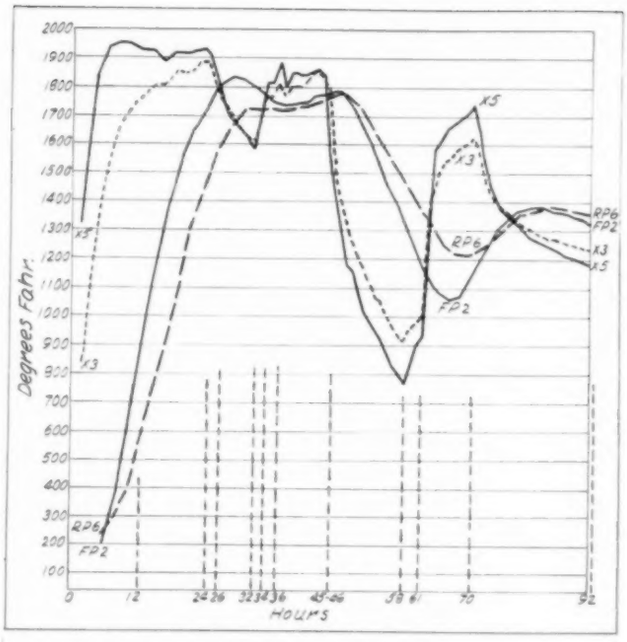
Quick Action at High Temperature

The second stage is that of holding or soaking, also called the primary stage of graphitization. It is in this stage where the most time may be saved as soaking time is dependent on temperature. The higher the temperature the shorter the time. We have stated before that for a temperature of 1832 degrees Fahr. only 3 hours is required whereas for 1652 degrees Fahr. 30 hours is needed.

Chemical composition and temperature of the iron before tapping also plays a part in determining the time required for annealing. It is known that the higher the silicon content the shorter the soaking period. It is claimed by some investigators that superheating the iron also tends to shorten the time required. However, so many variables enter, which makes it difficult to determine the exact effect of superheating, that we are unable to give any figures. That superheating is beneficial in more than one way there need be no doubt.

Referring to the theoretical diagram in Fig. 1 it may be noted that the soaking time at 1800 degrees is 6 hours. This may vary some but the diagram will serve as a guide in trying to cut down the annealing time or as the term now goes, to make short anneal malleable.

It is feared by some that a temperature of 1800 degrees Fahr. or over is likely to cause trouble. It is too close to the softening point and thus will cause warpage of castings. If care is taken in packing, no trouble need be encountered with the higher temperature. Others talk about burnt castings and warn against bringing the temperature too high. Castings are not burnt because of the higher temperature. If air is excluded from the pots no burning of castings will occur. The biggest objection to the high



Log of Furnace Operations

Hours
- 0 Fire started.
- 12 Note lag between couples.
- 24 Lag between pot couples has been reduced.
- 26 Fire stopped and dampers sealed.
- 32 Fire started.
- 34 Pot couples brought within 30 degrees Fahr.
- 36 Fire stopped and dampers sealed.
- 45–46 Exposed couples dropped 320 degrees Fahr. in one hour.
- 58 Exposed couples dropped to 910 degrees Fahr. Dampers closed to check fall in temperature.
- 61 Fire started.
- 70 Fire shut off and dampers sealed.
- 92 Dampers and fire box opened.
- 96 Total time, door opened.

FP2 Front pot couple.
X 3 Exposed side couple.
X 5 Exposed roof couple.
RP 6 Rear pot couple.

Fig. 2

temperature is the scaling and cracking of the pots. The life of the pots is reduced greatly for temperatures around 1800 degrees Fahr.

Air seeping through a crack in the pot will cause scaled or burnt castings. If unsuitable material is used for luting, it may crack or fall off, providing the danger of air finding its way into the castings. Another reason for scaled castings is badly warped pots. Pots, if badly warped also usually are scaled and thin. Due to their weakened condition they fall into one another after being heated, admitting air into the pots.

In the accompanying table the holding time is shown to be 8-6-7-8-7 and 7 hours respectively and the temperature 1806-1812-1812-1814-1806 and 1807 degrees. It will be noted that the holding time is somewhat longer than is given in the diagram, Fig. 1. The temperature is likewise higher by a few degrees. The figures representing holding time and temperatures are the averages of four couples for each of the six cycles.

Holding at means in the case of the small oven that the holding time is figured from the

time the temperature reaches 1800 degrees Fahr. on the heating up until it returns to this temperature. To illustrate: Cycle No. 1 reached 1800 degrees at 11:00 o'clock a. m., 1803 at 12:00, 1807 at 1:00, 1811 at 2:00, 1812 at 3:00, 1810 at 4:00, 1807 at 5:00, 1804 at 6:00 and 1800 at 7:00 p. m.

In case of the large oven the holding time is figured from the time the temperature reaches 1600 degrees going up until it reaches 1600 coming down. The average temperature for a given number of hours thus is given. This covers the second of the four stages of malleablizing.

Cooling Temperature Drops Uniformly

The third stage is that of cooling down to the critical point. The fast rate of cooling should stop well above the A_1 point. If the cooling is not checked before the temperature drops below 1400 degrees Fahr. there is great possibility of slipping through the critical range without giving the carbon time to precipitate. Cooling down may proceed as fast as conditions permit, bearing in mind that the temperature must drop uniformly throughout the oven. It often is necessary to manipulate flues and dampers to effect an even drop in temperature.

The fourth and concluding stage of malleablizing also is called the second-stage graphitization. As the term implies, the critical range is the most important of the four stages. There seems to be some difference of opinion as to the true location of this range. The critical point will vary in different irons and it is the author's belief that due to this it is better not to place this point at any fixed temperature. In an investigation the critical range was placed between 1290 and 1380 degrees.

The last thing in the preceding stage is to check the dropping of the temperature. This being accomplished the temperature then is allowed to drop slowly. From 1380 to 1365 degrees the temperature is dropped at a rate of 5 degrees per hour. It is then held around that temperature for 7 hours. We have found that by starting the fire once or twice no trouble is encountered in keeping the temperature between 1362 and 1368 degrees Fahr. for 7 hours. The temperature is again dropped 5 degrees per hour for 11 hours, which brings it down to 1290 degrees. The cycle now is completed and the doors may be taken away. However, it is customary to let the temperature drop somewhat below that figure before opening the door, as noted in the accompanying table.

We have come to the conclusion that the impact test is of greater importance than both producers and users of malleable castings have stated. We have found iron with high figures for tensile strength and elongation but which have failed in the impact test. We are looking for a thoroughgoing study of this matter.

Place Couples in Pots

At the outset of this investigation it was deemed necessary first to learn the behavior of the gases. In other words, to learn of the distribution of heat throughout the oven, both inside and outside of the pots. In the past it has been customary to place the couples outside the pots but it was quite evident that this method of recording was far from satisfactory. We therefore inserted one couple in each of the four corner stacks, one in front, one on each side and one through the roof, outside of the pots.

The temperature was read and plotted every hour and the curves in Fig. 3 show the temperature in various parts of (*Please turn to page* 107)

High Temperature Annealing Cycles

(Capacity of Oven 5-7 Tons)

Cycle No.	Heating to 1800 degs. hours	Holding at	Hours	Cool to 1400 degs. hours	Hold 1380-1290 hours	Cool and open	Door opened at	Total time hours
1	37	1806	8	12	21	2	1260	80
2	40	1812	6	17	23	3	1250	89
3	37	1812	7	14	22	2	1255	82
4	39	1814	8	17	24	1	1280	89
5	37	1806	7	15	21	2	1255	82
6	37	1807	8	24	32	3	1230	104

Medium Temperature Annealing Cycles

(Capacity of Oven 20-25 Tons)

Cycle No.	Heating to 1600 degs. hours	Holding at	Hours	Cool to 1400 degs. hours	Hold 1380-1290 hours	Cool and open	Door opened at	Total time hours
7	48	1665	32	18	23	3	1225	124
8	43	1674	32	12	22	2	1250	111
9	36	1663	35	13	23	2	1240	109
10	44	1674	33	12	23	2	1255	114
11	39	1662	33	14	21	2	1240	109
12	39	1666	33	14	37	2	1250	125

Physical and Chemical Analysis

Tensile strength	Elongation per cent	Carbon	Silicon	Manganese	Sulphur	Phosphorus
58,255	19	2.40	1.03	0.31	0.088	0.185
55,805	20	2.32	1.05	0.28	0.071	0.185
59,965	19½	2.32	1.07	0.33	0.071	0.180
58,135	21	2.41	0.88	0.31	0.080	0.190
60,175	23	2.30	1.08	0.31	0.072	0.180
58,495	25	2.30	1.13	0.27	0.079	0.185

Records are taken from six different heats. Castings from each heat have been annealed in one small and one large oven. Cycles 1-7, 2-8, 3-9, etc.

Tensile strength	Elongation per cent	Carbon	Silicon	Manganese	Sulphur	Phosphorus
57,585	19	2.40	1.03	0.31	0.088	0.185
55,055	20	2.32	1.05	0.28	0.071	0.185
62,630	18	2.32	1.07	0.33	0.071	0.180
61,030	23	2.41	0.88	0.31	0.080	0.190
59,135	15	2.30	1.08	0.31	0.072	0.180
57,035	23½	2.30	1.13	0.27	0.079	0.185

Questions and Answers

Covering important problems found in all phases of modern foundry practice

This department includes problems relating to metallurgical, melting and molding practice encountered in making castings. Questions from subscribers addressed to the Editor of The Foundry will be answered by members of the editorial staff, supplemented where occasion requires by the advisory staff.

Slag May Cause Hard White Specks in Brass Castings

We are having some trouble with our brass and also our 80-10-10 ingot. You will notice on the samples sent along that there are a lot of white specks in the castings. The small sample is from the top of the casting, and the large one from the bottom. These specks are so hard a tool bounces over them, and they are causing us plenty of grief. Can you tell us what is the trouble and how to overcome it?

The hard, white specks indicated in the sample might be inclusions of slags, it being well recognized that lead oxide plus silicon from some of the slags form lead silicate, which is equivalent to common window glass. This, of course, is too hard to be tooled and if caught in the casting would develop just the trouble described.

You do not say whether you use a flux in your bath during melting or not. Possible this may be mixed with the alloy. There are many slags that are so thin that they are not completely removed when skimming the bath before pouring and are, therefore, carried into the mold unintentionally.

It is difficult to be certain as to what is the cause of your trouble. If it is caused by the mixture of slags with the metal, the only correction is to be careful to skim the metal thoroughly and to pour the metal at a sufficiently high temperature to be sure that any inclusions will have ample time to rise into the risers before the casting sets.

Any alloy containing lead will have some lead oxide present by reason of the oxygen in the air uniting with the lead content to produce the lead oxide. The lead oxide readily combines with silicon from the crucible or from ingredients in fluxes to form lead silicate, which is a viscous, thick substance that is hard to remove entirely from the bath. Therefore it is carried in when pouring the mold to be entangled in the metal of the casting and give just the trouble you are experiencing.

Several Factors May Cause Chill Spots in Small Iron Castings

We are making some range burner bases with ⅛-inch rings which are machined and have sharp edges. The ring is made in a dry-sand core. Analysis of the metal shows 2.75 per cent silicon; 0.100 per cent sulphur; 0.30 per cent phosphorus, and 0.60 per cent manganese made with 45 per cent pig iron, 50 per cent cast scrap, and 5 per cent steel. The castings were all right for a period of 3 to 4 weeks, and then we ran into a light chill in the rings for several days when the weather was warm and damp with a relative humidity between 75 and 96 per cent. We use a cupola lined to 60 inches with 1-ton charges. The bed is fairly high weighing 2300 pounds, and air is supplied by a special blower at the rate of 375 pounds per minute. The iron comes down at 2700 degrees Fahr. with plenty of life. The cores are made with Providence core sand with a fineness of 175. They are fairly hard and bonded with linseed oil 1 to 40. Can you tell what caused the chill, and what range of phosphorus is suitable for the castings? Is there any danger in having it as low as 0.15 per cent?

Small castings frequently show chill spots unless the mixture, melting practice, and pouring methods are regulated carefully. As is well known, iron which normally is gray in structure, if chilled with sufficient rapidity, will form white iron castings. That is due to the fact that in the molten condition all the carbon is in the combined state, and is not allowed to change during solidification. Graphitization takes place from a point somewhat below solidification and continues at a diminishing rate down to somewhat below the eutectoid point about 1340 degrees Cent. (2444 degrees Fahr.). The graphitization reaction takes a certain amount of time. Naturally, there is not much time for it to take place during the cooling of a light casting and the situation is critical.

The foundryman helps himself by using high silicon and finally high carbon in his mixture since both assist rapid graphitization. Usually best results are obtained when the sum of (silicon percentage times 0.30) plus total carbon percentage is about 4.30 or slightly less. Excessively high carbon with high silicon often defeats its

purpose. Low carbon irons chill readily. Silicon may be run somewhat over 2.75 per cent but at 3.0 per cent or over it may cause other troubles. Phosphorus up to 0.50 or 0.70 per cent or over has a retarding action on graphitization as a hard, ternary eutectic type of formation composed of iron carbide, iron phosphide and iron, sometimes is formed in light castings. Usually phosphorus 0.30 per cent or less does not cause trouble. Sulphur retards graphitization unless sufficient manganese is present to offset it. In the present case the manganese is more than sufficient. The other elements appear to be well balanced except for the total carbon which is not given.

Considering all factors, there seems to be four possible sources of your chilling difficulty and they are: Change in pig iron or scrap; humidity conditions as noted; molding and pouring practice; and air-coke ratio. Some pig irons graphitize less readily than others although the analysis may be the same. You use a fairly large percentage of cast scrap with some steel, and scrap has a marked hardening influence in some mixtures. There also is the possibility of scrap iron or steel containing some chromium, and small percentages of that element hinder graphitization. In melting it is well known that when air saturated with moisture is used, irons chill more readily than when a drier blast is used. Pouring practice has considerable to do with the tendency to chill. Forced or hard pouring as it often is termed may produce softer castings in the hands of an experienced molder. Wet sand will cause chill spots in light castings. Give careful attention to control of the blast as excess air tends to produce iron that chills more readily than when the blast is correct.

Determine Acid and Iron Strength with Pickle Pills

Will you please give us the quickest method of making acid strength and iron sulphate determinations on a pickling bath? Also at what concentration of iron should the bath be changed for satisfactory results?

If you have laboratory facilities available, it is not difficult to make a determination of acid strength through use of standard sodium hydroxide solution, and of iron through use of a standard potassium permanganate solution.

However, the easiest method we know is the use of pickle and iron pills which may be obtained from several sources. The pills for acid strength are made in two types giving direct readings of 1 per cent sulphuric acid or 5 per cent muriatic acid. The iron pills are for sulphuric acid baths and give readings of 1 per cent iron.

All that is necessary is to take a definite amount of the pickle bath, and add acid or iron pills as the case may be until a color change takes place. Count the number of pills added, and the percentage of acid or iron is obtained.

For the most satisfactory results with a sulphuric acid bath, the iron content should not go over 6 per cent. With muriatic acid baths, it is said that iron acts as an accelerator in contrast to the effect in a sulphuric acid bath. Consequently, muriatic baths usually are not discarded until the iron begins to crystallize out in the tank.

Heat Treatment Changes Carbon to Pearlite and Cementite

Recently we examined a sample of white cast iron with a brinell hardness number of 450, which was as tough as annealed low carbon steel castings. It had an analysis of 2.17 per cent carbon; 1.17 per cent silicon; 0.29 per cent manganese; 0.081 per cent sulphur, and 0.94 per cent phosphorus. Can such iron be produced by heat treating? We make white cast iron grinding balls and liners, and would like to toughen our product. The material contains no alloys, and we are under the impression that the structure is pearlitic.

From the analysis given it is quite possible that the material is what sometimes is termed incorrectly semimalleable iron. It usually is a low carbon cast iron made in the air furnace or electric furnace, and is given a heat treatment closely paralleling that for malleable iron except for the time element—which is considerably shorter. Consequently instead of the carbon assuming the nodule or temper carbon state, it is changed to a mixture of pearlite and cementite—the amounts depending upon the temperature reached, the length of time under the temperature, and the rate of cooling after heat treatment.

By heat treating low carbon cast iron which originally is white or nearly white in fracture at say 1600 to 1650 degrees Fahr. for 4 to 15 hours or longer and then cooling slowly you can obtain varying types of structures. Many such irons are produced under patent licenses.

Sand Washes at The Gates in Green Sand

What type binder is best when applied in dust or liquid form to prevent the sand from cutting or washing in the gates of green sand molds.

You are approaching the problem from the wrong angle. Instead of attempting to doctor unsatisfactory sand in the region of the gates, the proper procedure is to use sand that does not require any treatment of that character. For the sake of argument it might be claimed that the addition of a small amount of practically any binder, supplemented by a skin drying will hold an otherwise weak sand in place, but this remedy is not practical in ordinary green sand practice.

Sand will cut or wash when: (a) It is too hard, too wet or carries too much bond. The steam cannot back away from the heated surface and therefore lifts flakes of sand in the vicinity of the iron (b) it is too soft, too dry, or lacking in bond and therefore is eroded by the passage of the iron. Sand of the proper composition, bond, permeability and moisture content, rammed to the proper density will not wash or cut. For extended reference to this subject see several of the articles in the series *Prevent Losses with Proper Gates and Risers* now being presented in THE FOUNDRY.

Increased Coke Will Prevent Oxidation

We are melting 14 charges of hard iron, 750 pounds to the charge in a 32-inch cupola in 2 hours. The coke bed is 40 inches above the top tuyeres. We use 100 pounds coke between charges for first three charges, 200 pounds for fourth and then 75 pounds for each charge thereafter. At about the eleventh tap the iron begins to emit brown and black smoke and sparks fly to a height of 3 feet above the bull ladle. The castings contain blow holes and pin holes.

All the symtoms in the foregoing presentation, gas holes in the castings, abnormal loss of silicon, manganese and nickel, brown smoke and sparks, satisfactory iron up to the eleventh tap, indicate that most of the iron is melted too close to the tuyeres. The iron is oxidized, bessemerized, or in ordinary foundry language, burned. You are not using a sufficient amount of coke between the charges to maintain the bed at the proper height.

White iron melts at a lower temperature than ordinary gray iron, but unfortunately molten white iron must be raised to a considerably higher temperature before it will run satisfactorily in the molds. Your present high bed and the 200-pound booster charge of coke on the fourth iron charge apparently maintain a fairly satisfactory level bed up to the eleventh tap. After that the bed no longer is high enough for satisfactory melting. Several alternative methods are available for correcting this condition, but since you omitted to mention the air pressure and volume we shall not touch upon them at the moment. Assuming that your fan is delivering approximately 2000 cubic feet of air per minute at a pressure of 8 ounces we suggest that you reduce the iron charge to 500 pounds and use 75 pounds of coke between charges throughout.

State Dimensions For 36-Inch Cupola

To increase our capacity we are contemplating the construction and erection of a 36-inch cupola. What are the principal dimensions, sizes of tuyeres, etc.?

Considerable latitude may be applied in every detail of cupola construction without impairing subsequent successful operation. The following figures are approximate, designed merely to serve as a general guide:

Inside diameter of cupola 36 inches; diameter of shell 50 inches; diameter of wind belt 66 inches; brick lining below charging door 7 inches, above charging door 2½ inches; height of columns 3 to 4 feet; diameter of blast pipe 14 inches; charging door opening 27 x 30 inches; height of charging door above bottom 11 feet; wind belt 8 x 45 inches; number of tuyeres, seven, 4 x 8 inches at shell, flaring to 15 inches at face of lining.

For example the height of the charging door above the bottom is given as 11 feet. Cupolas are in existence with the charging door 30 feet above the bottom, while on others the door is only 6 feet above the bottom. Local conditions, including existing buildings, usually exert an important influence on whoever makes the final decision. Modern tendency favors a charging door sill flush with the charging floor.

A cupola of this size will melt 5 tons per hour, on a consumption of 2050 cubic feet of air per minute supplied by a blower driven by a 10 horsepower motor. The power consumption will be 12 kilowatt hours.

Every feature in connection with the construction, operation and maintenance of the cupola is covered in *Melting Iron in the Cupola*, by J. E. Hurst, which may be ordered through THE FOUNDRY for $5.15.

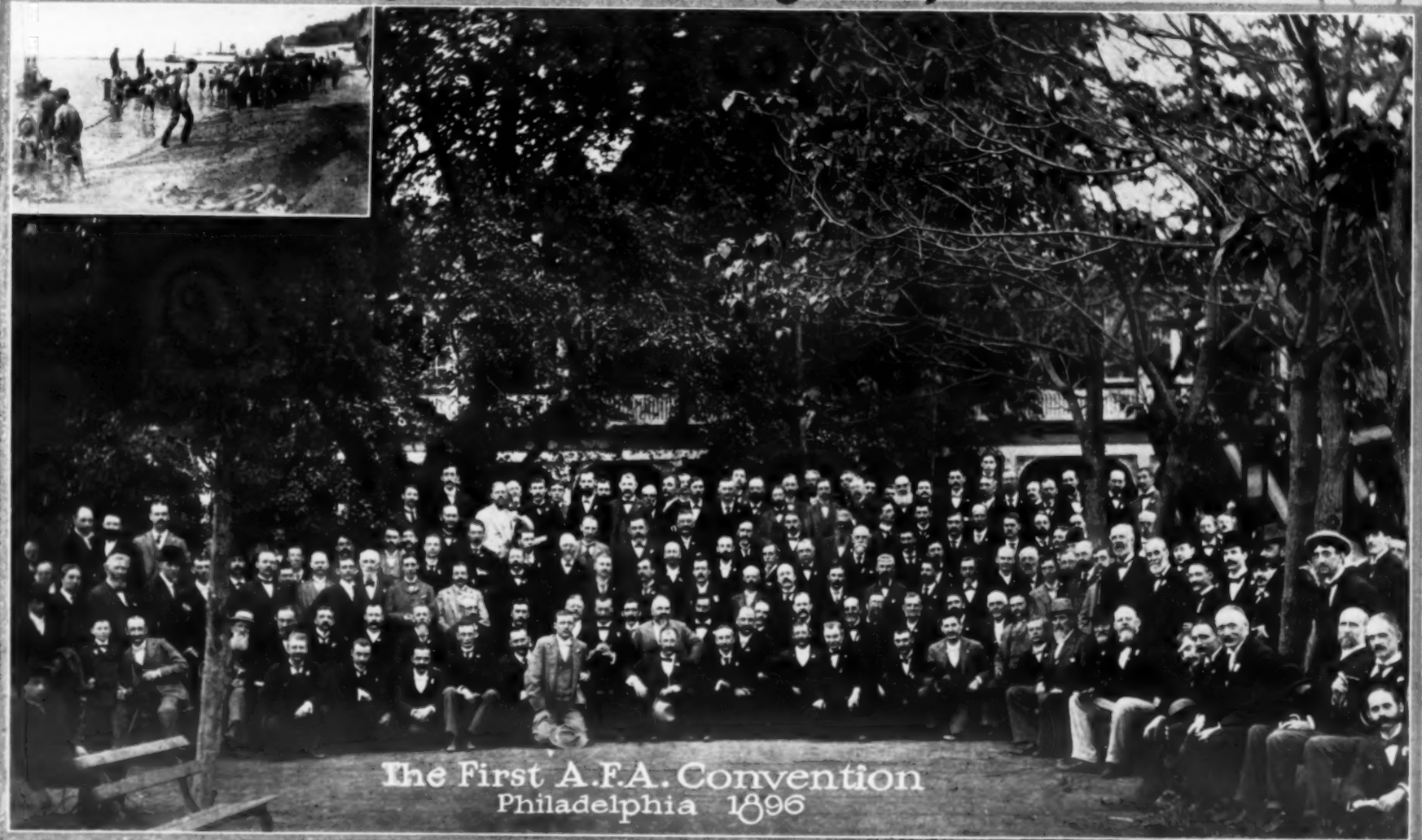
Pitted Surface May Be Due To Metal

We manufacture warm air furnaces and other heating equipment, and use aluminum alloy patterns. We usually make our aluminum matchplates ranging from ⅜ to 1¼-inch thick and up to 72 inches in diameter. As a general rule they come out with a nice finish although occasionally we have one that has a rough or pitted surface which we would like to eliminate. Our aluminum alloy, which is scrap crankcases or the general run of aluminum scrap, is melted in iron pots in coke fired salamanders. A good aluminum flux is used. The molds which are made from a good grade of aluminum pattern sand, are skin dried. Pouring temperature is judged by eye. Our scrap is not completely stripped of bolts, nuts, etc., as we always find some in the bottom of the pots. We use an ample numbers of risers and also chill heavy sections where necessary. The trouble with the rough or pitted surface usually shows more readily on the heavier and thicker plates than on the lighter, thinner ones.

The rought or pitted surface on your aluminum alloy matchplates is due to a combination of gases absorbed by the metal during melting and pouring at too high a temperature. When you are melting the scrap down, pieces of it extend above the pot top so that they are exposed to the action of the furnace gases. Also judging the pouring temperature by eye is far from infallible as slight differences in the light of the foundry make the metal appear hotter or colder than it really is. With the amount of pattern pouring you do, a pyrometer would pay for itself in short order. Correct pouring temperature is an important factor.

Since your patterns must be accurate, our suggestion would be to employ an aluminum alloy made from virgin metals in your shop or purchased in ingot form. Such metal has uniform properties of contraction, etc., while the miscellaneous scrap, you now use does not. Secondary or remelt aluminum alloy in ingot form purchased from a reputable firm also will be uniform in its properties. Some of your difficulty might be eliminated by melting down your scrap, pouring in into ingots, and remelting the ingots for the work in hand. By that method any gases absorbed during the first melting and held in the ingot largely will be eliminated during the second melting if the molten metal is not held in the pot under heat for an excessive time. Melt the metal rapidly, do not heat it any higher than necessary, and pour it as soon as possible after leaving the furnace.

The FOUNDRY Family Photograph Album



The First A.F.A. Convention
Philadelphia 1896

Men of Industry

Whose Activities Are Making Foundry History

WILBUR H. WINTERS has been elected vice president in charge of operations, American Brake Shoe & Foundry Co., New York. After 5 years on fortification construction work on the Panama Canal, Mr. Winters entered the employ of the American Brake Shoe & Foundry Co., in 1916. In 1921 he was appointed assistant comptroller and in 1924 transferred to the operating department as general superintendent of foundries. He has been active in the preparation of the code of the gray iron foundry industry and is a member of the code authority of that industry and a director of the Gray Iron Foundry society.

❖ ❖ ❖

WILLIAM C. KATKER recently resigned as president of the Favorite Stove & Range Co., Piqua, O. He has been connected with that organization since 1924.

❖ ❖ ❖

ARTHUR J. BUSCH, formerly connected with the King Mfg. Corp., Buffalo, and the E. R. Caldwell Co., Bradford, Pa., has been appointed foundry superintendent of the Dobbie Foundry & Machine Co, Niagara Falls, N. Y.

❖ ❖ ❖

D. M. WILHELM, for 7 years connected with the Patterson Foundry & Machine Co., East Liverpool, O., and for the past 4 years sales manager, has been elected secretary of the company. He is succeeded as sales manager by E. M. UNDERWOOD, former division sales manager at East Liverpool, O.

❖ ❖ ❖

E. P. YOUD, metallurgist, Bullard Co., Bridgeport, Conn., addressed the meeting of the Connecticut Foundrymen's association at Mill River Country club, Stratford, Conn. on Sept. 21. Mr. Youd spoke on the chemical analysis of irons most suitable for castings of different characteristics.

❖ ❖ ❖

HYMAN BORNSTEIN, director of laboratories, Deere & Co., Moline, Ill., has been re-appointed chairman of committee A-3 on Cast Iron of the American Society for Testing Materials. W. H. ROTHER, metallurgist, Buffalo Foundry & Machine Co., Buffalo, has been elected vice chairman and E. K. SMITH, metallurgist, Electro Metallurgical Co., Chicago, has been made secretary.

❖ ❖ ❖

COL. HENRY COCKSHUTT has retired from the presidency of the Cockshutt Plow Co., Brantford, Ont., but will continue as the chairman of board of directors. C. GORDON COCKSHUTT, formerly vice president, has been made president and GEORGE A. BAKER, of Canadian Leather Products Co. Ltd., Toronto, has been elected second vice president.

❖ ❖ ❖

DAVID C. ZUEGE, Sivyer Steel Casting Co., Milwaukee, has been elected chairman of the Milwaukee chapter of the American Society for Metals, succeeding R. N. Hurliss, Milwaukee Vocational school. W. J. Spriling, Chain Belt Co., has been elected vice chairman, and A. E. Rauch, Globe-Union Mfg. Co., secretary.

❖ ❖ ❖

J. TRANTIN JR., formerly connected with several foundries in the middle west in the capacities of metallurgical engineer and research director, now is engaged in consulting work at Youngstown, O. Mr. Trantin has developed several alloy irons and steels for special application in the steel mill industry and also has designed a rapid melting open-hearth furnace of 100 to 1000 pounds capacity.

❖ ❖ ❖

DR. CHARLES H. HERTY JR., former director of research of the mining and metallurgical advisory boards, Carnegie Institute of Technology, has been appointed research engineer in the development and research department of the Bethlehem Steel Co., Bethlehem, Pa. Dr. Herty was graduated from the University of North Carolina in 1918 and from Massachusetts Institute of Technology in 1921.

❖ ❖ ❖

PAUL R. RAMP, recently appointed foundry superintendent of the Straight Line Engine Co., Inc., Syracuse, N. Y., for many years has been prominently connected with the foundry industry in the East and the Middle-West and has been a frequent contributor to the technical press. Since his first promotion to the position of foundry foreman at the age of 21 he has had charge of many foundries including in recent years the H. & B. American Machine Co, Pawtucket, R. I., and the Newport News Shipbuilding & Drydock Co., Newport News, Va.

❖ ❖ ❖

H. A. H. PRAY has been appointed assistant physical chemist at Battelle Memorial institute, Columbus, O. In 1921 he obtained a B. A. and an M. A. degrees from Oberlin college and received a Ph. D. degree from the University of Wisconsin in 1925. From 1926 to 1933 he was professor of chemistry in West Virgina university.

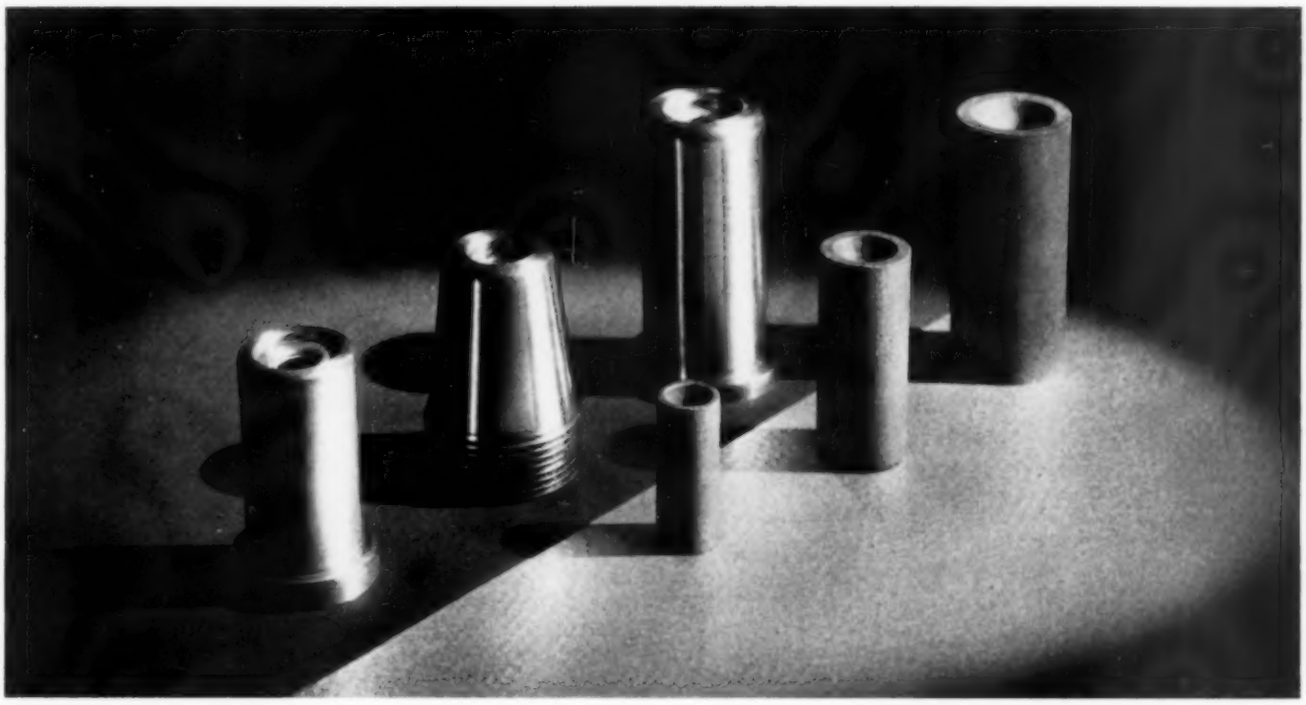
R. W. DAYTON has been appointed assistant metallurgist of the institute. In 1931 he was graduated as a chemical engineer from Renssalaer Polytechnic institute and received his M. S. degree in 1932 and his Ph. D. in 1934.

R. S. PEOPLES also has joined the staff of the institute. He was graduated from Ohio State university in 1933 with a degree in metallurgical engineering.

The Foundry Invites You

A cordial invitation is extended to its many friends to visit the booth of THE FOUNDRY in the new exhibition hall at Philadelphia during the A.F.A. convention, to use all of the facilities offered, and to rest after the strenuous round of inspecting the exhibits. Associated papers of the Penton Publishing Co. also will be represented at the booth.

The following members of the editorial and business staffs will be in attendance: Dan M. Avey, Frank G. Steinebach, Pat Dwyer, Edwin Bremer, Earl L. Shaner, A. H. Allen, B. K. Price, J. D. Pease, J. M. Lathrop, J. F. Ahrens, S. H. Jasper.



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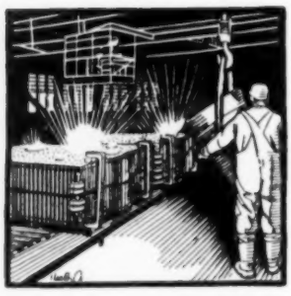
Viewing Foundry Developments



At Short Range

IN A Midwest foundry where large pots and kettles are made in loam molds, the second and any succeeding duplicate castings are made in a fraction of the time required for the first casting. The combined cope and core is removed immediately after the casting has set and before contraction commences. Shortly afterward the casting is lifted out of the drag part of the mold. A minimum amount of repair restores the mold to its original condition. In some instances where a high, straight wall might interfere with the ready removal of the core, a narrow section is removed first from either side. This is effected by incorporating a chain vertically in the wall of the core. After the casting has set, the chain is pulled out of the core, thus providing the necessary contraction relief.

♦ ♦ ♦

ONE of the newest developments relating to steel castings is that shown in a recent patent which concerns use of metal molds which are plated with copper, nickel or chromium, or with various combinations. Copper is the preferred metal as it leaves an extremely smooth surface on castings but it does not resist heat as well as some of the others. Consequently, to obtain the best results, it is preferable to first plate the mold surface with copper, then with nickel and finally with chromium.

♦ ♦ ♦

Metal chills for iron castings sometimes can be eliminated by the use of small amounts of chromium. It is the usual custom when the iron is running too soft, to increase the surface hardness where necessary by chilling with metal chills. Addition of small amounts of chromium will likewise impart the desired hardness to the castings and this can be done conveniently through ladle additions of ferrochromium. One per cent usually is sufficient to produce hardness throughout the casting though the effect of the chromium is somewhat influenced by the original analysis and structure of the iron.

♦ ♦ ♦

Sand cast aluminum castings produced in a French automobile foundry have the following analysis: Aluminum, 91 per cent; copper, 8 per cent; iron, 0.60 per cent; silicon 0.40 per cent; and magnesium 0.10 per cent.

♦ ♦ ♦

DIFFICULTIES encountered in use of ordinary water-bonded sand molds for pouring magnesium castings is said to be overcome through use of hexafluophosphoric acid, ammonium hexafluophosphate, monofluophosphoric acid or ammonium monofluophosphate according to a patent. From 0.5 to 10 per cent of those compounds are used in the green sand, but preferably 3 to 6 per cent. For thin section castings 2 to 5 per cent is employed.

♦ ♦ ♦

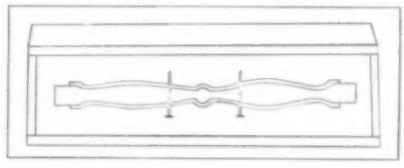
Rotor casting for the supercharger used on the Graham car is made in permanent molds from an aluminum alloy by the Bohn Aluminum & Brass Corp. The alloy has a tensile strength of 50,000 pounds per square inch, and rotors have been tested up to 45,000 revolutions per minute and have run 100 hours at high speeds without failure.

♦ ♦ ♦

An English company recently has introduced an alloy of low specific gravity and high tensile, combined with good casting properties, which has the following analysis: Copper 2.5 per cent; nickel 1.5 per cent, magnesium 0.8 per cent; iron 1.2 per cent; silicon 1.2 per cent; cerium 0.15 per cent; and aluminum the remainder. It is said that cerium has a refining action on the macrostructure, allows beneficial mechanical effects of a high iron content to be obtained by suppressing the embrittling iron-aluminum constituent, and provides a metal which runs easily.

♦ ♦ ♦

IN A variation of the usual method of setting chaplets top and bottom on long, slender cores, the chaplets are set horizontally. Transverse slots are cut in the joint of the split pattern at the desired location for the chaplets. When the drag is rolled over, 6-inch spikes are placed in these slots and pressed into the sand of the joint. Corresponding slots are formed in the core. After the two



halves of the core are pasted, 6-inch spikes are inserted so that they project an equal distance on each side. When the core is placed in the mold, the spikes rest in the impressions formed in the sand of the mold joint and hold the core in place. After the casting is shaken out the spikes are knocked out and the holes are plugged with metal of the same composition as that in the casting.

♦ ♦ ♦

A recent patent states that molten pig iron tapped from the blast furnace and then subjected to a heat treatment in a gas-fired furnace from 1 to 4 hours at 1430 degrees Cent. will produce fine grain graphitic structure pigs when cast into the usual chill mold. The structure is retained in the resulting castings after remelting the pigs in the cupola.

ADVERTISING PAGES REMOVED

Prevent Losses with

Proper Gates and Risers

By PAT DWYER

MANY interesting features connected with the gating and casting of cast steel chains have been developed in the foundry of the United States navy yard, Portsmouth, Va. The entire operation from the construction of the coreboxes to the final proof tests of the chain was described and illustrated in considerable detail by J. C. Pendleton in the June 1, 1930, issue of THE FOUNDRY. The present discussion is confined to the gates and risers with a few additional explanatory references to some of the related features.

Up to the present the navy and the merchant marine practically have been the only users of cast steel chains. Method of assembling and gating the molds, with certain modifications may be adopted on a wide variety of castings that lend themselves to pouring in stacked formation. In the present instance 40 precast links are poured from one sprue, and 36 connecting links also are poured from a single sprue. Completed chain must conform to the following rather rigid navy specifications: Tensile strength, 100,000 pounds per square inch, minimum; yield point, 60 per cent of the ultimate tensile strength, minimum; reduction in area, 18 per cent, minimum; and elongation in 2 inches, 10 per cent, minimum.

Requires Two Operations

Cast steel chains are cast in dried oil sand molds and the process involves two principal operations. In the first the required number of single links are cast. In the second these links are placed in molds containing horizontal and vertical cavities. The precast links are placed in the horizontal cavities. Then the liquid steel is poured into the vertical cavities. In this manner the links are united to form a continuous chain unit of any desired length. The length is known as a *shot* and usually is 15 fathoms or 90 feet. A 1-inch wire diameter chain will contain 273 links.

One of the cores for forming the precast links is shown in Fig. 254. This is the cope half of the complete core and contains gates, sprue openings *A* and *B* and the riser openings *C*. In assembling the cores a short piece of cylindrical core is placed in each of the four gaps *D*, one at each end and one at each side. These cores locate each pair of cores accurately so that the upper part of each link cavity coincides with the link cavity immediately below.

Metal flows through the sprue *A* to a centrally located runner in a supplementary flat core on the bottom of the stack, and then rises through the sprues *B* and *B*. The sprues extend from the top to the bottom of the stack. A horizontal runner between each pair of cores conducts the metal to comparatively small gates leading into the link cavities. The riser in the vicinity of the gates extends through the core and is closed on top by the bottom face of the core immediately above. These blind risers, or shrink bobs furnish the necessary amount of metal for feeding each pair of links.

The stack of five pairs of cores is built up on the flat core containing the bottom runners and resting on a flat iron or steel plate. A second flat plate containing openings for the runner and riser cores is placed on top of the stack and bound to the lower plate by two long bolts. With this arrangement, 40 links are cast each time the stopper is lifted in the ladle nozzle. Seven stacks supply a sufficient number of links for two shots of chain, with seven spare links left over. For repair or replacement jobs the stack may be cut down to any required height with a corresponding reduction in the number of link castings secured at a single pouring. Up to the present a five-high stack containing 40 links appears to the the maximum which can be handled with safety.

Arrangement of cores, gates and risers for the second operation, that is where the connecting links are poured, is shown in Fig. 255, a cross sectional view at the left and a side elevation section on the line *CD* at the right. Three of these units mounted in line on a steel foundation are poured through the single sprue *P*. On a production basis six of these triple units are mounted on the foundation. Thus the ladle can be carried along the line and with six openings of the nozzle produce 216 links connecting an equal number of the precast links, to form parts of four chains. By successive setups the chain may be extended to any length, straight or endless.

Made in Four-Part Core

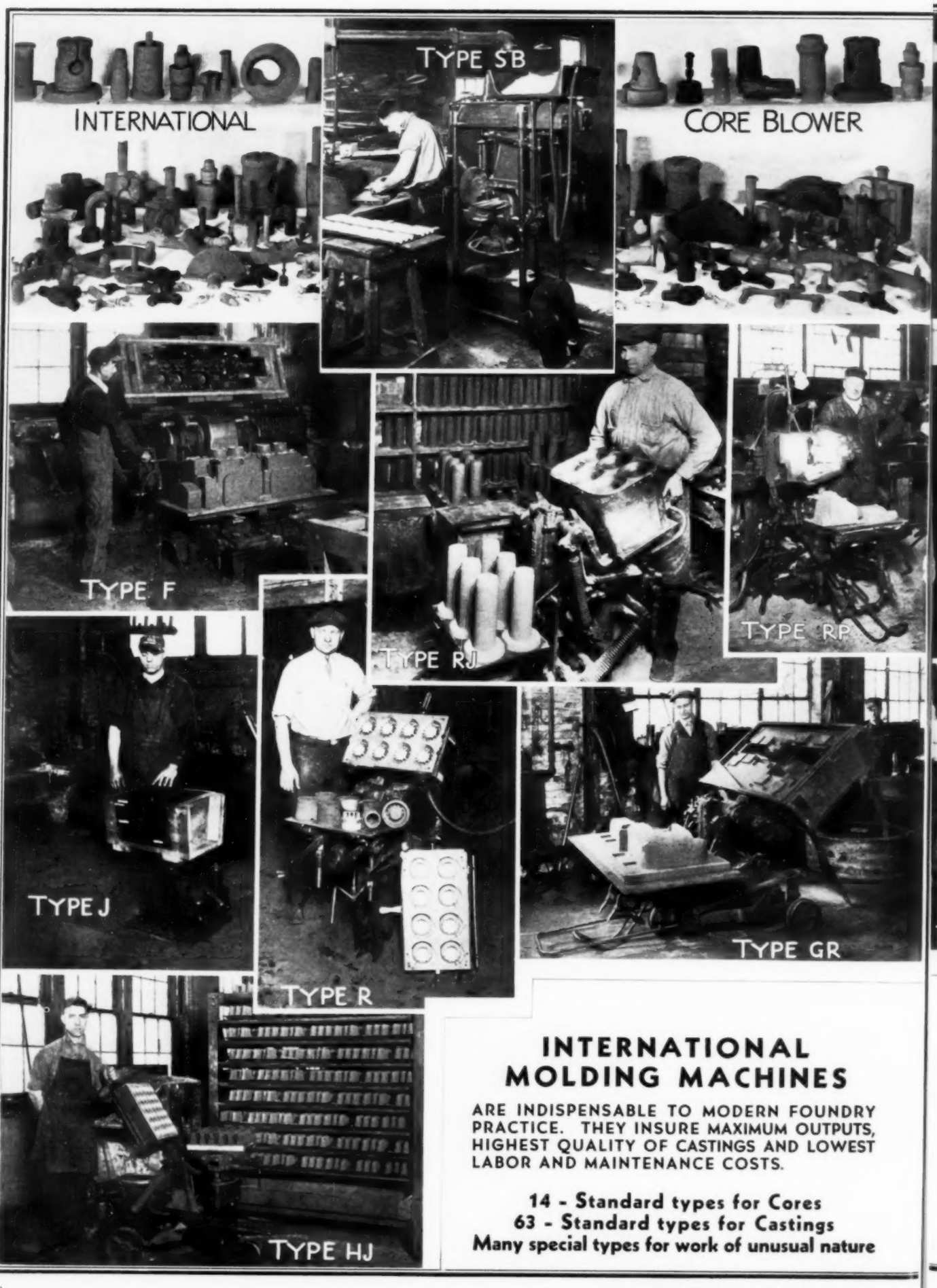
The core for forming the links is made in four parts, *E*, *F*, *G* and *H* and four of these groups are assembled as shown at the left in Fig. 255 with a flat thin core *M* extending from top to bottom in the center. The only function of this flat core is to provide passages for the metal. These include the main sprue *P*, the main horizontal runner *Q*, the supplementary sprues *R* to carry the metal upward, and the gates *N* and N_1 which discharge metal through the round gate openings *K* into each riser. In this manner the freshest, hottest metal remains in the risers, the ideal arrangement for feeding the castings.

Heavy lines in the sectional view at

(*Continued on page* 64)

Cast Steel Chains

IN MOLDING and casting steel chains at the United States navy yard at Portsmouth, Va., the molds are made up of a number of dry sand cores arranged in stacked formation. The method involves two operations. In the first the molds containing 8 links are stacked 5-high to produce 40 separate links at one pouring. In the second these precast links are placed in a second series of molds where the connecting links to the number of 36 are poured around them. The gates are arranged to discharge into the feeding heads and thence into the mold cavities. In this manner the hottest metal remains in the feeding heads where it is needed, the total amount of metal is reduced to a minimum and the chipping cost is reduced.



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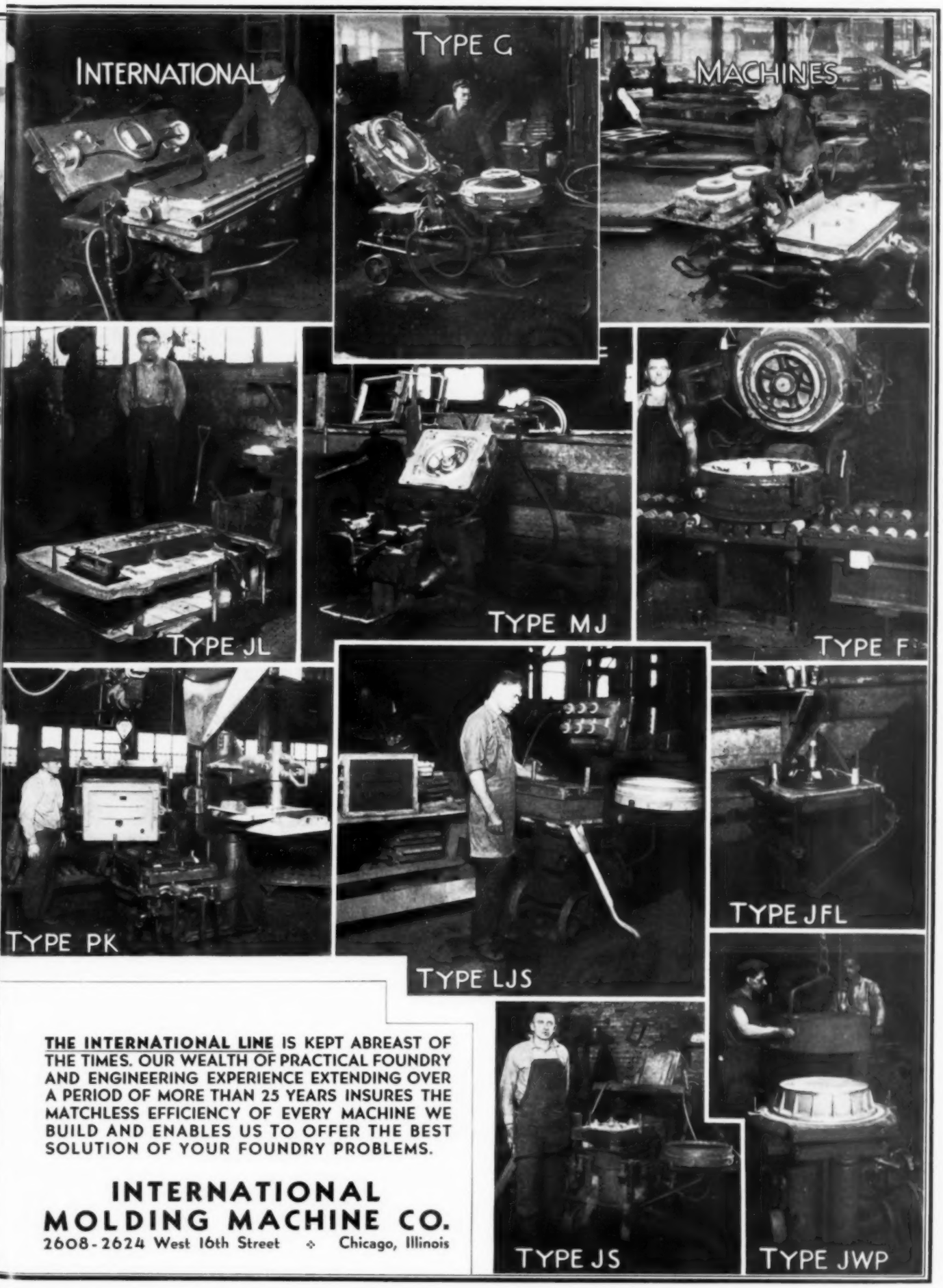

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(*Continued from page* 61)

the left merely are introduced to indicate the division lines in the core and to clarify a description which otherwise might be difficult of comprehension. Since the link patterns are arranged in the coreboxes on center lines, the cores are symmetrical. Thus one box serves for a right or left core for the cope half, and another box serves to make the two halves, right and left, but somewhat shallower than the cope, for the drag core. After the individual units have dried, the parts *G* and *H* are pasted together, and the parts *E* and *F* treated in a similar manner.

In assembling the mold the division core containing the sprues, runner and gates is set up. A *GH* core is placed on each side of this center core. The precast links then are placed in the cavities *Z*. The double core *EF* then is placed on top of each of the *GH* cores. The process then is repeated for the upper part of the assembly. After the unit has been assembled, pieces of steel plate are laid up against the two sides and united by tie rods which pass through the holes *T* in the cores. When these rods are drawn up tight the cores retain their position without any weights on the top. A pouring cup is placed over the central sprue and a small cup over each riser serves as a continuation for the column of metal in each sink head. One of the advantages of this method is that the riser in each instance serves as a gate and feeder and thus reduces the amount of chipping and grinding on the castings. In the shakeout process the castings readily are knocked from the gates and most of the sand is reclaimed.

Large Risers Needed

The steel foundryman, especially when attempting for the first time to make castings outside the range of his usual experience, finds himself between the Scylla of over weight risers and consequent waste of metal, and the Charybdis of inadequate size risers that do not feed the casting properly. As pointed out previously, large, high risers absolutely are essential on castings that must be clean and solid throughout, for example pressure resisting castings, castings that are machined extensively, or castings subject to severe, stress, strain or shock. Naturally, the amount of time, effort and materials employed in removing excess metal increases the cleaning cost.

For purpose of illustration, typical costs on high pressure valves per pound may be taken as follows: Metal in the ladle, 2.25 cents; molding cost, 4.5 cents; cleaning, 2.15 cents; rejections and losses, 1.00 cent; annealing, 0.50 cent; total cost, 10.40 cents per pound.

From this it may be seen that cleaning accounts for about 20 per cent of the total cost. On special large or complicated castings the cleaning cost may amount to 50 per cent. On a steel motor frame casting weighing 1300 pounds a gang of four men worked for 2 days preparing it for the machine shop. Even with apparently generous heads several shrinkage cracks appeared. These had to be chipped out and filled by welding. On later castings of this type many of the fins were eliminated by improved molding technique. The amount of head metal was increased and shrinkage was eliminated. The gating method also was changed to

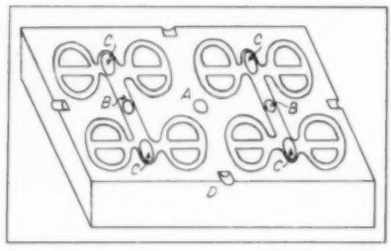


Fig. 254—When the cores are stacked the metal descends through the central sprue A and rises through the sprues B in the center of the runner

permit the latest metal to enter through a higher gate.

While location of feeding heads largely is determined by local conditions, current practice and past experience, the foundryman also should keep in mind the cost of removing these heads. In many instances it is possible to introduce certain modifications in location or dimensions, which, while not adversely affecting the proper function of the riser, will facilitate removal. For example the cylindrical head on top of a comparatively narrow flange may be extended laterally. Instead of being set directly on the flange it may be offset slightly to leave a definite and clearly defined area which serves as a guide for the cutter.

Although referred to previously, the point will bear reiteration that the first consideration in the design and location of a feeding head is that it shall supply sufficient feeding metal to the casting. Up to the present no definite formula has been developed for that purpose. The foundryman depends on study and past experience. Adjoining thick and thin sections always develop a tendency to produce a crack. The heavy section near the junction point must be fed with sufficient hot metal to prevent shrinkage.

Having determined dimensions and location of the shrink head to prevent shrinkage defects, the problem of how the header is to be removed should be considered. Through neglect of this feature, headers have been placed in positions where they cannot be reached with the cutting torch. Intelligent preliminary study of the problem usually will obviate this trouble.

Hot Metal Increases Cost

Usually, high temperature metal increases the cleaning cost on account of the tendency of the metal to *burn in* to the sand, especially the cores, in the corners or in any position where the metal contracts against the mold face, instead of away from it. So far as is practicable, the temperature of the metal should be regulated in accordance with the peculiarities of the mold. A large bulky casting may be poured at a lower temperature than a small thin casting. Plain castings, large or small may be poured at a lower temperature than castings of more complicated design.

As with every form of advice of a general character, common sense must be applied to the acceptance. Reduction in temperature easily may be carried too far for safety. However, in many instances a modification in the arrangement and size of the gates will permit use of metal with a lower temperature than formerly was necessary to insure a full run casting.

Reverting for a moment to the subject of stacked molds and the running properties of molten steel it is interesting to note that a foundry in

(*Concluded on page* 67)

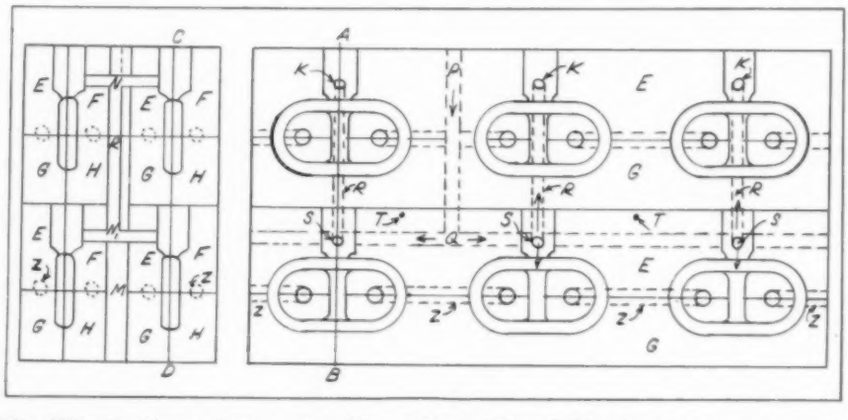


Fig. 255—Sections of core assembly on lines CD and AB show the arrangement of links, gates and risers

ADVERTISING PAGES OMITTED

western Pennsylvania has developed the process to a point where 14 molds are stacked to a height of approximately 8 feet. The molds are all drags with the bottom face of one mold serving as a cope for the mold immediately below. Metal is poured down through a central sprue and distributed at each level by four small gates leading to the four valve cage casting impressions. Feeding risers are placed on the four castings occupying space at the top of the stack, but the other castings are fed adequately through the gates attached to the large central sprue. The molds are made in 12-inch square flasks and dried. The metal is converter steel and 56 castings are poured at one time on the floor area nominally required for four.

This is the fifty-seventh of a series of articles dealing with the various types of gates and risers used in the foundry industry. The fifty-eighth will appear in an early issue—THE EDITORS.

Code Authority for Alloy Castings Approved

Code authority for the alloy casting industry recently was approved by the National Recovery administration as follows: Chairman, A. W. Daniels, vice president, American Manganese Steel Co., Chicago Heights, Ill.; H. H. Harris, president, General Alloys Co., Boston; J. D. Corfield, alloy sales manager, Michigan Steel Casting Co., Detroit; C. E. Malley, alloy sales manager, Ohio Steel Foundry Co., Springfield, O.; V. B. Sullivan, vice president and general manager, Michiana Products Corp., Michigan City, Ind.; W. H. Worrilow, president, Lebanon Steel Foundry, Lebanon, Pa.; and W. C. Whyte, vice president, Electro Alloys Co., Elyria, O.

Chilling Effect Of Molds Is Not Rapid

Authorities have stated that iron or permanent molds are ideal for casting leaded bronze castings of heavy section where the lead content is not over 30 per cent, and the tin content not less than 4 per cent. Marius says that experiments have shown that the chilling effect of iron molds is not rapid enough with binary alloys containing high lead content, and ternary alloys with low tin content, to eliminate the conjugate liquid phases of copper and lead at solidification, although lead segregation and sweating are not so intense as with sand casting. The segregation and sweating mentioned as occurring with sand castings can be eliminated by careful attention to pouring temperature which should be around 1800 degrees, using not over 2 ounces of phosphor-copper per 100 pounds of metal, and employing a suitable flux, say 2 per cent barium sulphate.

Shows Method of Making Impeller Pattern

By Harold Nash

Construction of an accurate pattern for the type of impeller shown in the accompanying illustration presents several difficulties. Blades are tapered top and bottom and there is no flat surface on which to lay out the curvatures. To give high efficiency in the pump, the impeller requires a fine degree of accuracy in the curve angle, spacing and uniformity of the blades. The impeller unit is finished by riveting a cover casting to the part shown.

Present description covers the making of a single metal pattern. A wood master pattern for matchplate work is made practically in the same manner.

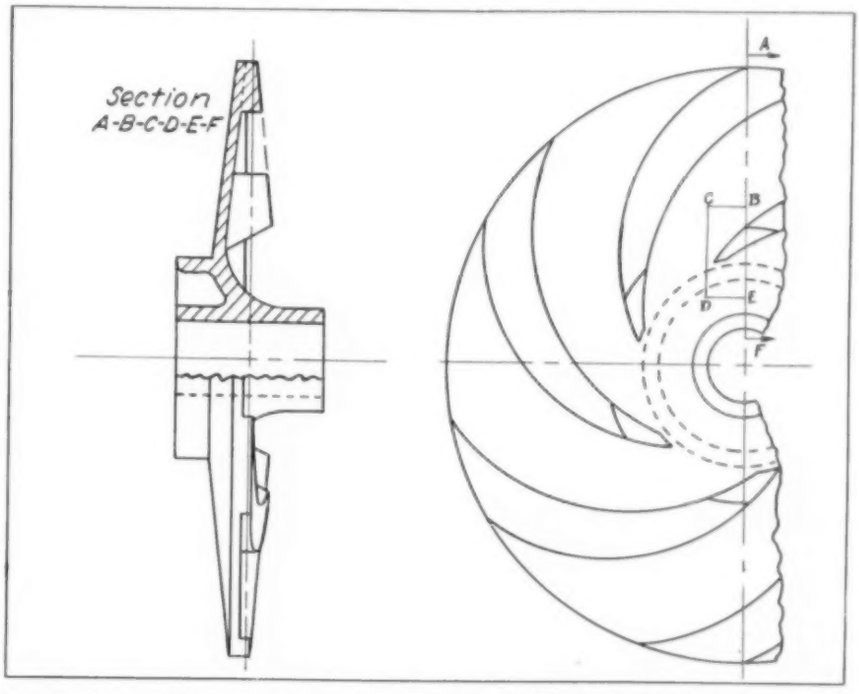
Patterns for this type of casting originally were made by turning the beveled plate part in a lathe. A wood piece the shape of the blade was fitted to the face of the plate. This wood piece then was used as a master pattern to secure the required number of blade castings. Blades then were located by a sheet metal templet and filed, fitted, doweled and soldered in place.

Patterns made according to that method were not sufficiently accurate and were quite expensive where a large number were required. A new method recently developed is more satisfactory. In this method the beveled plate is turned in the lathe as before. Then a flat metal disk, the diameter of the impeller and thickness of the inner or high ends of the blades is beveled on one face and fitted to the plate. The outlines of the blades are scribed accurately in their proper position on the upper or flat side. Two or more dowel or location holes then are drilled through each blade as laid out on the disk. The holes are continued through the plate. Each blade, still a part of the disk, is marked and a corresponding, identifying mark is placed on the plate.

The plate then is removed and replaced by a wood block, flat on one side and dished on the other side. This block supports the disk while the operator is sawing the blades on the band saw. The blades are cut out as close as possible to the line and then finished and filed true by hand. The finished blades are doweled in their proper places on the plate through the holes already drilled for that purpose. A tight joint is made by sweating, and the blades are reinforced further by small solder fillets at the junction. The assembled pattern then is placed in the lathe and the top edges of the blades are machined to the required bevel.

Moves Office

Chicago Pneumatic Tool Co., New York, has moved its Birmingham, Ala. Office from 1829 South Second street to 211 South Twentieth street. W. S. Lynch is manager.



Plan and sectional view of impeller pattern in which the blades are sawed from a solid disk, then doweled and soldered to the back plate

EQUIPMENT

A LIST OF TYPICAL INSTALLATIONS

American Steel Foundries Co. 4 plants

Atlas Foundry Company

General Electric Co. 3 plants

Bohn Aluminum & Brass Corp.

Stanley G. Flagg Co.

Griffin Wheel Co. 8 plants

Allyne Ryan Foundry Co.

Eastern Steel Castings Co.

Muncie Foundry & Machine Company

Chapman Valve Manufacturing Company

National Malleable & Steel Castings Co. 3 plants

Reliance Steel Castings Co.

United States Aluminum Co.

Clark Equipment Co.

Southern Wheel Co. 3 plants

Niles Tool Works

National Radiator Co.

Ludlow Valve and Manufacturing Company

Lima Locomotive Works

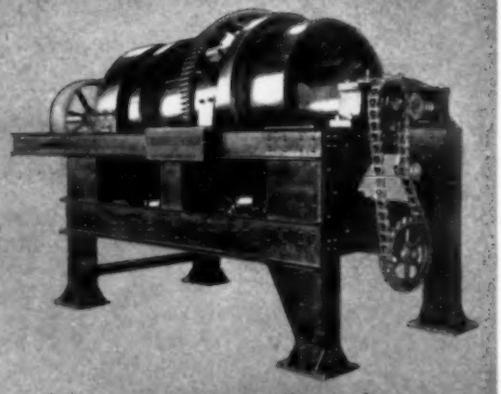
Chevrolet Motor Co.

Chrysler Motors Corporation

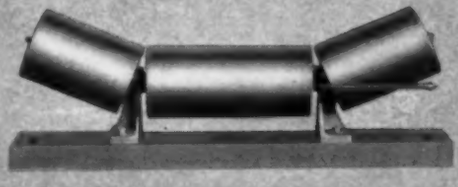
Birdsboro Foundry & Machine Company

The Sandwich Foundry Co.

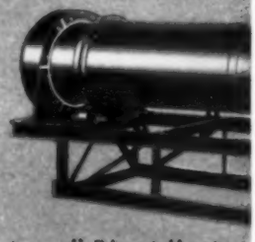
The Shakeout . . . this is but one of several types.



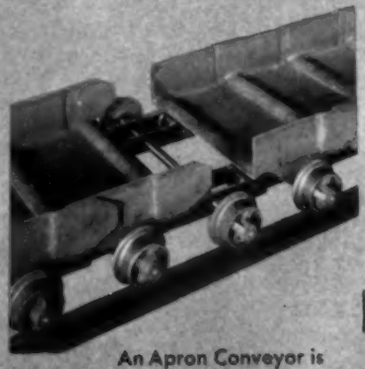
The Continuous Muller produces an even temper, fewer lost molds.



Series 10-20 Belt Idlers . . . one of five different designs.



A small Direct Heat Dryer for foundry sand.

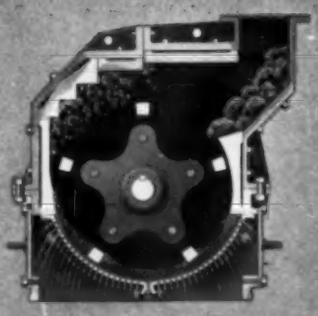


An Apron Conveyor is ideal for hot castings.

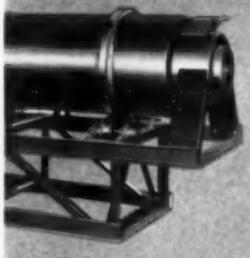
The squirrel cage Aerator cools and reconditions the sand.

BARTLETT

FOR *Every* FOUNDRY



The Cyclo-Pulverizer breaks up the cores . . . reclaims the sand.



The Type M Gate for overhead hoppers . . . opens easily—closes instantly.

WANT to cut your costs . . . lower rejections . . . increase efficiency? Look to Bartlett-Snow equipment! Designed by engineers who pioneered this newer, now fully accepted foundry practice, Bartlett-Snow Shakeouts, Aerators, Conveyors, Dryers, Screens, Hoppers and Gates, translate theoretical into practical operating advantages. Hundreds of partial, and scores of complete installations in iron, brass, bronze, steel, malleable and aluminum foundries attest the skill with which Bartlett-Snow foundry experts solve even the most trying foundry problems. What is your problem?

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Nonferrous Group Discusses Costs

All districts represented as association re-elects officers at Chicago convention

COMPLETING its first year of service, the Nonferrous Foundry Association for Industrial Recovery held its annual convention in Chicago, Sept. 19 to 21, with representatives present from all of the ten geographical districts. Open sessions gave opportunity for members of the industry to engage in full discussion of the cost estimating and accounting system, proposed trade customs and other details covering the provisions of the nonferrous basic code and its supplements. The district directors whose election was noted on page 44 of THE FOUNDRY for September organized as the new code authority. In addition to the ten district representatives, each of the four divisions which have been established will be represented on the basic code authority by the chairman of the group administration agency. The division representatives are as follows: Aluminum permanent mold, D. D. Francis, National Bronze and Aluminum Foundry Co., Cleveland; blast furnace division, Harwood Smeeth, Smeeth-Harwood Co., Chicago; steel and rolling mill division, H. A. White, National Bearing Metals Co., Pittsburgh. The miscellaneous sand casting division was organized at the Chicago convention. N. H. Schwenk, Cramp Brass and Iron Foundries, Philadelphia is chairman and representative on the general code authority, F. N. Flynn, Arthur Harris Co. Chicago, is vice chairman.

Need Knowledge of Costs

The cost system, published in THE FOUNDRY for September was discussed and approved with minor modifications for submission to NRA for approval. In introducing the subject at the Wednesday morning session, F. S. Jarrow, public accountant stressed the need for cost knowledge even where individual conditions forced an occasional sale below cost. Attention was directed by Sam Tour, executive secretary, to the method of normalizing fixed overhead by comparison with a normal which has been established as 60 per cent of the best consecutive six months production in pounds of castings.

General costs of doing business, such as interest on investment, interest on debts, research and development, declines in market value of inventory and other items not permissible under NRA rulings are grouped with the profit item and are not mandatory. However, a foundry accused of selling below cost is amenable to penalty unless it can produce by a system of approximating the standard that its price was above cost.

Attention was called to conflicting methods of establishing the departmental share of overhead in items 52, 62, 72, 82, 92 and 102. The parenthetical expression (based on labor hours or payroll dollars) should be removed from these items. A discussion of the percentage loss in melting led to the establishment of 5 per cent for copper base and 3 per cent for aluminum alloys as the minimum.

An earlier decision to omit fair practice provisions from the basic code and set these forth as standard trade practices was sustained by vote at the industry meeting. A committee submitted these trade customs for discussion and adoption. It was voted to exclude terms of payment from the standard trade customs, by reason of the wide variation in practice in various sections and foundry centers.

The Thursday morning session was devoted to a general open meeting to consider a proposed classification for nonferrous castings. This classification is suggested to supplement an interpretation of the provision in the basic nonferrous foundry code which specifically forbids quoting on a flat price per pound for a variety of castings of widely varying weight and intricacy. The classification was prepared by a committee under chairmanship of James L. Wick, Falcon Bronze Co., Youngstown, O. It proposes a classification only for small castings made from loose patterns as bench or floor jobs. Four main divisions are suggested, the first being the simplest possible casting without cores, and requiring no special equipment. The second classification designated as medium covers castings with single cores self-supported, runners and risers removable by band saw and with simple patterns. The third classification designated as semi-intricate covers somewhat more complicated cored jobs not requiring special bedding or dryers, with a limitation of gating volume of not over 50 per cent of the weight of finished castings. The fourth classification designated as intricate is left for the determination from each individual pattern.

Apply to Loose Patterns

A further measure is suggested based upon weight varying from ⅛-pound up to 150 pounds and with quantity differentials ranging from a single casting to a lot of 125.

All of these classifications apply to loose pattern nonproduction jobs. The intent is to provide a measure whereby proper differentials may be supplied and to avoid setting up slight artificial variations to evade the code prohibition of flat pricing. By vote of the organization it was decided to refer the proposed classification back to the committee for further study and development.

The afternoon session was devoted to the organization of the miscellaneous sand casting division of the nonferrous foundry industry. This division embracing the largest number of foundries in the industry has never been set up separately since the organization of the association in July, 1933. District directors in the ten main geographical sections will be elected and these with a president and vice president representing the country at large will compose the administrative agency for the sandcasting division. The president of the group will become a member of the code authority of the industry representing the sand casting division. The division also considered and approved the uniform cost estimating system which was discussed at the Wednesday meeting. W. A. Janssen, formerly connected with the American Steel Foundries and now deputy administrator, National Recovery Administration in charge of 42 mining and quarrying

(*Concluded on page* 102)

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$100 CASH PRIZE

Gentlemen, try your skill and good fortune in naming this new machine..a remarkable development in lowering cleaning costs.

TO THE WINNER WILL GO $100.00 IN CASH!

It is easy to compete in this contest Study the mechanical features and advantages on opposite page.

The machine can also be seen in operation at Philadelphia.

WRITE FOR CONTEST ENTRY BLANK NOW.. or ask for it at the convention. Select the name which you believe is most appropriate and write not more than 100 words giving your reasons for name suggested.

JUST READ THESE EASY RULES

(1) Anyone connected with the foundry industry can compete, except employees of The W. W. Sly Manufacturing Company.

(2) You may suggest as many names as you wish provided each name is accompanied by not more than 100 words, giving your reasons.

(3) Should two or more persons select the name which is adjudged the most appropriate, the award will be made to the contestant giving the best reasons for his choice.

(4) The decision of the contest judges shall be final.

(5) All entries must be submitted on our official entry blanks - - - and postmarked before midnight November 10, 1934. The prize will be awarded within 10 days after contest closes.

SLY

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4703 Train Ave., Cleveland, Ohio

BLAST CLEANING EQUIPMENT • TUMBLING MILLS • DUST COLLECTION

All letters look alike to her

The Adventures of Bill

BY PAT DWYER

BILL came in the other night while I was engaged in the peaceful occupation of knocking out a more or less friendly letter to a lad who professed that he always had held me in the highest esteem. Temporarily he was financially embarrassed. If I kindly would forward, say, $50, check, draft, money order—he generously bowed to my discretion on this point—why, his former esteem would advance at least 10 points and he begged to remain in confident anticipation mine very truly.

Unfortunately, intentionally or unintentionally he neglected to specify whether this cash contribution was to be regarded as a gift or a loan. At one time this might have been a factor in influencing my decision. In the present instance I was relieved of the necessity of making up my mind on this point. Gift or loan he might just as well have asked me for the Taj Mahal.

I had just thanked him for his spontaneous burst of esteem and the implied compliment of assuming that I fairly jingled as I walked with double eagles and pieces of eight. Period. Paragraph.

The next paragraph, the diplomatic and velvety refusal to ship the goods under any conceivable condition presented certain difficulties in composition and brought me up standing. Had I been alone, the proper words probably would have occurred to me, but the spectacle of Bill gazing at me seemed to paralyze my fingers and effectually dried up all inspiration. Probably a latent form of stage fright, closely related to the aversion some people have for eating where they are exposed to the gaze of strangers.

Bill is quite immune to any weakness of this character and professed to be highly amused when I said I could write no more while he sat there goggling at me like a calf with the blind staggers, or a-a-a blinkin' owl.

"A nowl, hey?" said he. "If you had half the wisdom of an owl you would not be sitting there wasting an hour composing a flowery letter to a bird who is trying to nick you. Send him a post card with the word NO in large capitals and he'll get your meaning as perfectly as he would from six sheets of deckle edge, cream color, scented paper covered with a mess of baloney. Better still, don't write. He'll understand.

"Talking about getting the meaning out of queer letters, I wonder if I ever showed you a copy of one received by the Ferracute Machine Co., Bridgetown, N. J., a few years ago. Apparently the timid little stenographer had a few lingering doubts of the accuracy and mailed it out in the bunch dictated but not read. Maybe the lad dictating the letter mumbled his words, and then again the lady's ear rings may have interfered with a perfect reception. Anyway here it is:

Very Cute Machine Co.,
Bridgetown, New Jersey.
Gentlemen:

Kindly four wad us by return male your best prop position on a size 20 lunch press, osculating type, for forming mettle cough ins from steal sheets. The confound dyes for giving the cough in body the proper finish will be designed by our engineering core, so you can obit these from your notations.

This press is to be bold connected to ten horses, 110 colt, 80 lamp ear, 750 hour P.M. deceased motor. A paragraph.

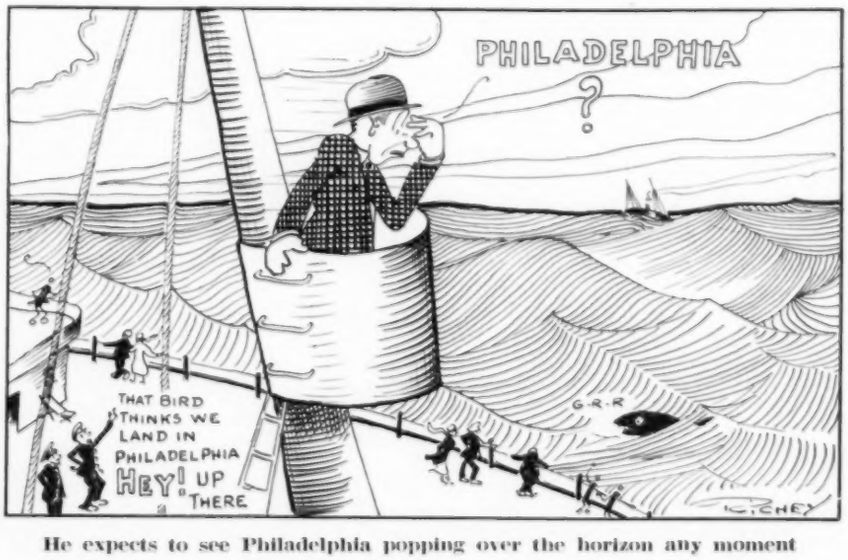
It is to be of messy design built in concordance with the following specifications:

Frame is to be of gassed iron with forge and steal driving shaft. Osculating cranks are to be of bold rolled steal with phosphate bronze bear rings. Safety pins are to be Rome fickle steal of ample tense eel strength and high model loose of electricity. The curl springs for absorbing the shocks of the traveling head are to be of breeze silly aunt spring steal free from any fried rations.

A queer pump for the oily system is to be provided to insure a liberty circulation of the goober nut at the queer blade putty edge. Wire underclothes to be installed around movie parts and other safety features provided to prevent the undertaker from being pinched.

Yours very truly,
The Eternal Comfort Coffin Company
OH: MY

(*Concluded on page* 76)



He expects to see Philadelphia popping over the horizon any moment

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for the FOUNDRY

Careful application of equipment can give the benefits of "continuous process" production to many foundries, both small and large, now operating with less effective methods.

Call upon Link-Belt for help in the engineering of new layouts,

Vibrating screen shakeout, and anti-friction roller mold conveyor.

Belt conveyor handling sand to molding line.

additions, rearrangements or replacements of parts, no matter how small.

Send for book No. 1090 on Foundry Equipment.

LINK-BELT COMPANY,

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The Molding Sand
REVIVIFIER

The Link-Belt revivifier mixes, aerates and "fluffs" prepared sand, producing a sand heap with the right "feel". A sand that will ram to even, uniform density in the mold. Made in 4 sizes, for maximum capacities of from 50 to 150 tons per hour.

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"NO-LEAK"
Apron Conveyor

A rugged, durable, efficient conveyor for handling molding sand. Close fitting, accurately formed pans, with staggered, overlapping offset side plates welded to the ends, effectively prevent leakage. All parts subject to wear and replacement are particularly wear-resistant, and easily replaceable with a minimum of expense and time.

An apron designed and built especially for foundry service.

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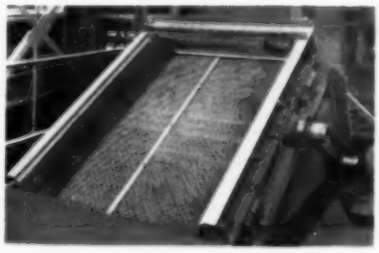
Side view showing close fitting, accurately formed pans, with overlapping offset side plates welded to the ends.

LINK-BELT VIBRATING SCREEN
The Ideal Sand and Shakeout Screen



this unit for the separation of sand and castings.

Screen cloth is easily changed and renewed. 100% screening area is obtained.

"A Triumph of Mechanical Vibration"

In reclaiming molding sand and preparing it for use again, it saves sand and bonding material, and produces a more uniform grade of good sand.

Many foundries have also reduced shakeout costs by using

A double deck vibrating screen unit for reclaiming molding sand. Removes fines, and oversize refuse.

5122

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See Our Exhibit—International Foundry Congress—Philadelphia—Oct. 22-26

(*Concluded from page* 74)

"There y'are," Bill remarked. "What do you think of that for a sample of the well known English language as she is writ?"

"Well," I admitted, "as a specimen of written English, the thing certainly is revolting and in that respect bears a family resemblance to the cryptic notes employed by all high class government spies in time of war. The recipient of the note extracts the trusty code book from a secret panel in the leg of his pants and readily deciphers the message before he gulps the wad of paper like a gannet swallowing a fish. Just one gulp and it's gone!

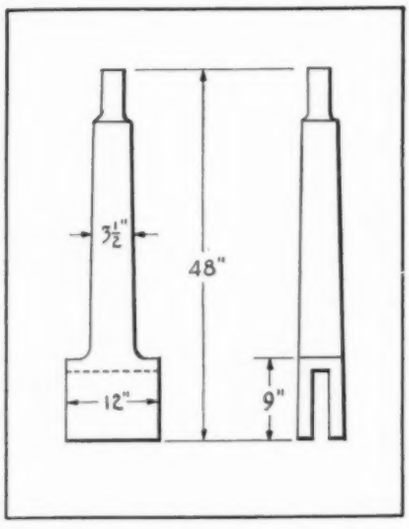
"However, to the initiated these mysterious messages present no difficulty. In the present instance I know what the writer meant, you know what he meant and I have no doubt the Very Cute Machine Co., readily supplied all the information required on the No. 20 punch press. So-o-o, what's the difference if the note does not make sense to those who write and read English by note and sight and not by ear?"

"Well," said Bill, "I'll tell you. I suppose we are all in the same boat so far as knowledge of anything outside our immediate ken is concerned. I had a letter the other day from a lad who is coming over from Europe to attend the A.F.A., convention and among other items of information he wanted to know what Philadelphia looked like to one coming in from the sea. Apparently he is familiar with the fact that Philadelphia is a great ocean port, but he does not know that the city is situated on the Delaware river 100 miles from the landfall off the Delaware capes and that over 40 miles of the sovereign state of New Jersey separate the city from the nearest point on the long Atlantic coast line.

"I wrote him not to worry about what Philadelphia looks like to one coming in from the sea. He is not going to come that way. With the other visitors he is coming by rail from New York and he will see plenty after he arrives.

"That reminds me of another letter I had recently from a man who was having his own troubles in the production of a bronze rudder stock casting. He is a highly competent foundryman. Has been in business for many years, engaged in the production of nearly all classes of castings, but frankly this one had him puzzled.

"Here is a sketch of the manganese bronze casting on which he claimed he had tried every method within his experience, but had not succeeded in producing satisfactory castings. Unfortunately he did not go into details and therefore I cannot decide whether the methods in themselves or his method of application were or was at fault. Instead of saying 'I did thus and so, but the castings were



Front and side views of casting

wasters,' he said, 'I wish you would take a look at this sketch and then make suggestions regarding the proper method of gating and feeding this casting to prevent cooling, shrinkage and surface defects.'

"As with many castings, several methods are available for making the mold. The method adopted in any given instance will depend to a certain extent on the existing equipment and custom of the shop. For example the casting might be poured in a vertical position, but this method automatically is ruled out if the molder has no iron flask and if he is not accustomed to making skin dried or dry sand molds. Again, it is possible that the splitting core at the lower end may be responsible for the unsatisfactory skin in that vicinity. Manifestly this is a point to be taken up with the coremaker rather than with the molder.

"Roughly the casting may be described as a manganese bronze shaft 3½ inches in diameter and 4 feet in length. One end is spread out approximately to the shape and size of a double bladed spade 12 inches wide and 9 inches deep. A flat core in the center splits this part of the casting in two. The opposite end of the casting for a distance of 6 inches is reduced to a diameter of 1½ inches.

"Any molder accustomed to the peculiarities of manganese bronze, would not attempt to gate the casting at either end. Manganese bronze does not present as much difficulty, or is not quite as temperamental as aluminum bronze, but the same general factors are present and the same general methods are to be applied in either case. A gate at one end would not produce a solid aluminum bronze shaft even as small as 2 inches in diameter and 12 inches in length. Outwardly it may appear to be solid, but if the bar is cut, a cavity will be found in the center. Diameter of this cavity will decrease toward the ends and taper off like a double end pencil.

"This shrinkage can be prevented in either aluminum or manganese bronze by placing a large feeding riser close to the side of the shaft and by pouring the metal through this riser into the mold. The riser is connected to the casting by a large gate cut partly in the cope and partly in the drag.

"The metal is not poured directly down into the riser. It is poured first through an ordinary sprue, connected at the lower end to a horn gate which discharges the metal into the base of the riser. The object is to retard to some extent the speed with which the metal enters the mold and with this end in view, the horn gate is set in reverse to the usual position. The small end is placed next to the runner and the large end delivers the metal into the base of the riser. With this arrangement the metal fills the mold slowly and gradually without agitation. The resulting casting will be solid and clean.

"In the present instance the feeders should be at least 4 inches in diameter, with one approximately at the center and one near the large part of the shaft at each end, and with each riser built up 6 inches above the top of the cope. The foregoing may be regarded as the maximum for diameter and height and is suggested for use on the first casting. Later, if and when duplicate castings are ordered the height and diameter of the risers may be reduced gradually until signs of shrinkage appear. The condition of the metal in the risers also must be taken into account. Fresh, lively metal in a comparatively small riser will feed the casting more effectively than dull metal in a larger riser.

"Preferably, a manganese bronze casting is poured from the lowest point so that the metal climbs slowly over an inclined surface in filling the mold. However, the shaft shown in the illustration may be poured in a horizontal position, because it is fed subsequently through the risers with hot metal.

"Metal is poured through the sprue in the usual manner until it appears in the risers. The metal in the sprue then is covered with a little sand and an iron weight. Usually also water it spilled on the metal to cool it. Fresh, hot metal then is poured down one riser until the metal in all three risers has attained an equal level approximately 6 inches above the top of the cope.

Buys Division

Hauk Mfg. Co., 126 Tenth street, Brooklyn, N. Y., recently has purchased the assets of the oil burner division of the Mead-Morrison Mfg. Co., manufacturers of portable torches and forges.

ADVERTISING PAGES REMOVED

Convention Draws Foundrymen

(*Concluded from page* 28)

represents the exchange paper of the Czechoslovakian Foundry association, while "Steel Castings" by Dr. W. H. Hatfield, Brown-Firth Research Laboratories, Sheffield, England is the annual exchange paper provided by the Institute of British Foundrymen. A report of committee on classification of carbon and alloy steels for castings also will be presented at that time.

Election of officers and directors of the association for the coming year is one of the numerous important items of business to be transacted at the annual business meeting of the association to be held at 3 p. m. on Thursday. A special feature of that meeting which will provide much of interest to every foundryman, will be a special lecture to be given by Arnold Lenz, Chevrolet Motor Co., Flint, Mich.

The shop courses on Thursday will discuss "Core Sands and Binders" and "Electric Furnace Melting." As has been the custom at recent conventions, instructors in engineering and foundry practice and apprentice training will meet for dinner that evening.

Will Hold Joint Meeting

In recent years, the American Foundrymen's association and the American Society for Testing Materials have held a joint meeting in connection with the annual convention of the A.F.A. This year's session, to be held Friday morning, will be a symposium on tests and specifications and will include the following papers: "Chilling Properties of Cast Iron," by W. H. Spencer, American Cast Iron Pipe Co., Birmingham, Ala.; "Investigation of Test Bars," by C. M. Saeger Jr., U. S. bureau of standards, Washington; "Fatigue Tests of High-Strength Cast Irons," by H. F. Moore and J. J. Picco, University of Illinois, Urbana, Ill.; "Horizontally Poured Test Bars," by Garnet Phillips, Frank Foundries Corp., Moline, Ill.; "Testing Cast Iron," by R. S. MacPherran, Allis-Chalmers Mfg. Co., Milwaukee; and "Test Bars," by J. T. MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala.

Problems pertaining to foundry equipment in general will be discussed at the Friday morning session on materials handling with the following papers included in the program: "Selecting Foundry Equipment as an Investment," by R. J. Heisserman, Link-Belt Co., Philadelphia; and "Foundry Maintenance," by James Thomson, Continental Roll & Steel Foundry Co., East Chicago, Ind. Four papers will be presented at the final shop course on sand control, dealing with the following subjects: "Comparison of Some Methods Used in Determining the Fineness of Sands," by R. C. Hill, Cornell university, Ithaca, N. Y.; "Analysis of Sea Coal as Applied to Black Sand," by R. E. Aptekar, Ypsilanti, Mich.; "Flowability of Molding Sand," by H. W. Dietert and F. Valtier, H. W. Dietert Co., Detroit; "Effect of Silt on Bonding Strength of Sands," by H. Ries, Cornell university, Ithaca, N. Y. Reports of sand committees also will be made at that session.

Following the close of the morning session, transportation will be available direct to the special train which will conduct the party to Bethlehem, Pa. for the inspection of the plant of the Bethlehem Steel Co., under auspices of the Philadelphia Foundrymen's association. The special train is scheduled to leave at 11:45. The Bethlehem Co., specializing in the production of large, heavy castings, operates a group of foundries melting ferrous and nonferrous metals. The group includes a steel foundry equipped with five open-hearth furnaces with individual melting capacities ranging from 15 to 80 tons; a gray iron foundry with three cupolas which have a combined melting capacity of 40 tons per hour; an ingot mold foundry which takes metal direct from the blast furnaces; and a nonferrous foundry divided into two main sections. One is devoted to the production of a wide range of miscellaneous castings, while the other section is equipped with special machines for the centrifugal casting of pipe or tubes in sizes ranging up to 30-feet in length and 40 inches in diameter.

For many years, the company has supplied large quantities of cast iron sections employed in lining tunnels under the tidal waters in the vicinity of New York. Special equipment has been developed and installed for the production of those castings. An article in the Sept. 1, 1931 issue of THE FOUNDRY describes the molding and casting of a platen for the forging press which weighed 230 tons cleaned and machined. Gross weight of metal in the casting including sinkheads, runners and gates was 290 tons.

Two other large foundries that will be open for inspection by foundrymen attending the convention are the Philadelphia navy yard and the Florence Pipe Foundry & Machine Co., Florence, N. J. The navy yard, one of the largest in the world, is devoted exclusively to the production and maintenance of navy vessels and equipment. The yard has steel, gray iron and brass foundries. It has been arranged that visitors will see the pouring of one of the large propeller castings.

At the Florence Pipe Foundry & Machine Co., Florence, the visitors will observe the latest type of centrifugal equipment for making cast iron pipes. Besides the pipe plant, that organization also makes heavy working machinery, fire hydrants, etc. In addition, other interesting plants such as the Budd Mfg. Co., Henry Diston & Son, Point Breeze Refinery of the Atlantic Refinery Co., S. K. F. Industries, and Radio Corp. of America at Camden, N. J. will be available for inspection. Information may be obtained at the plant visitation booth in the convention hall, where members of the local and plant visitation committees will be in attendance.

A ladies' headquarters and registration desk will be maintained in the Bellevue-Stratford hotel starting Monday. On Tuesday, a reception and tea will be held between 3 and 4:30 in the Bellevue-Stratford hotel. A luncheon and style show at Wanamakers, one of the largest stores in the city, has been planned for Wednesday. On Thursday, the ladies will go on a sight-seeing trip by motor, with visits at the navy yard, Christ church, Independence Hall, Betsy Ross house, etc. On Friday, the ladies will visit Valley Forge and will have a luncheon enroute. The ladies' entertainment committee will assist in organizing groups for special trips during the week.

Pittsburgh Founders Meet

Pittsburgh Foundrymen's association met at the Fort Pitt hotel, Monday evening, Sept. 17, to make arrangements to receive foreign delegates to the American Foundrymen's Association's International Convention at Pittsburgh on Oct. 19.

Frank J. Lanahan, president of the A. F. A., spoke at meeting, and told of some of the American Foundrymen's Association committee work and arrangements which are to be made for the entertainment of the foreign visitors.

Publishes Report

Recently, the bureau of mines published a report on "Temperature-Viscosity Measurement in the Systems CaO-SiO_2 and CaO-SiO_2-CaF_2," by G. H. Herty Jr., F. A. Hartgen, G. L. Frear and M. B. Royer. The report, which is in the form of a 32-page mimeograph bulletin, describes the methods and apparatus employed in the work, and the results obtained. The report presents results of work done under a co-operative agreement between the bureau of mines, Carnegie Institute of Technology, and the Metallurgical Advisory board.

Announcing

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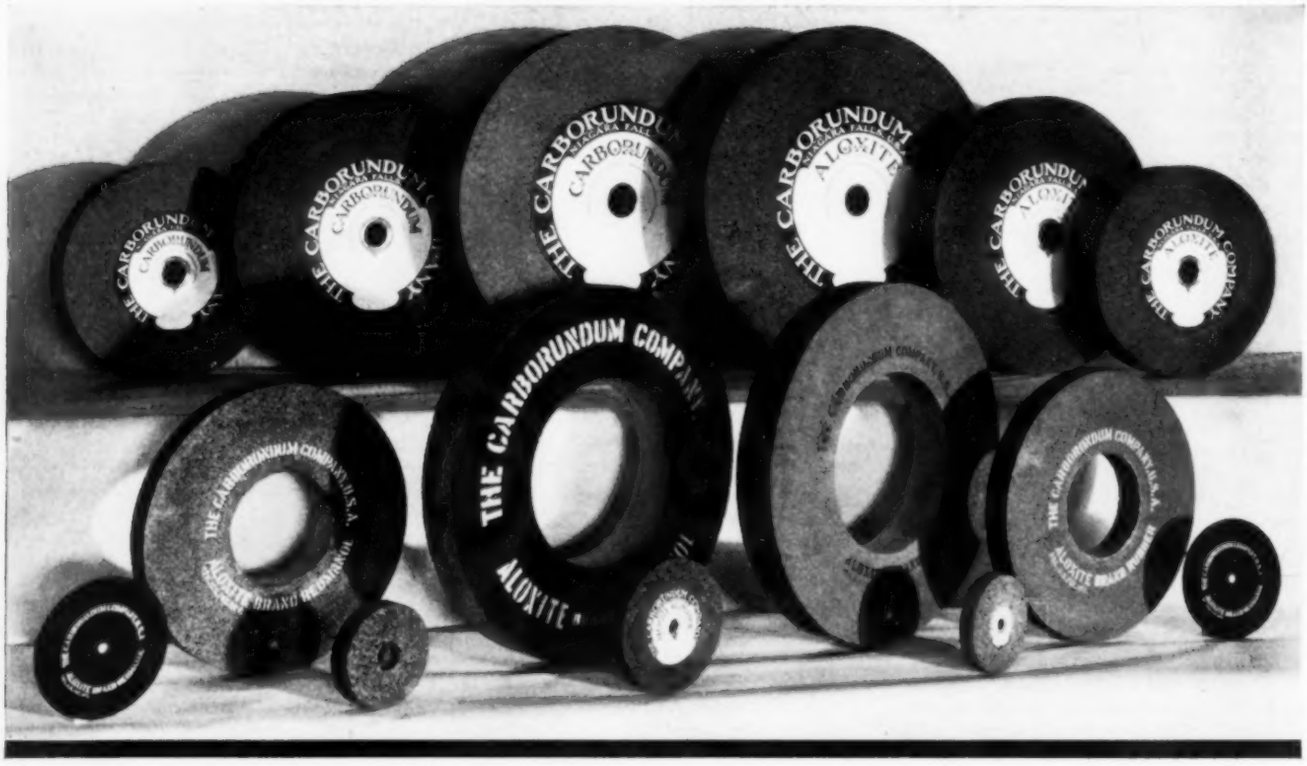
New IMPROVED RUBBER BONDED WHEELS



THESE WHEELS SET NEW STANDARDS IN FOUNDRY AND BILLET GRINDING PRACTICE

FOR some long time we have been concentrating on the improvement of foundry and billet grinding wheels—new bonds, new types of wheel structure, closer gradings.

Now we can announce, after exhaustive field tests, the setting of new production and grinding cost standards. These improved wheels range from those for portable grinders to the large, heavy, snagging wheels for malleable and steel foundries. A complete new line of Carborundum and Aloxite Brand Bonded and Vitrified Wheels, plus the highly improved Rubber Bonded Wheels.

The new production and cost standards have been made possible because of closer control—a greater nicety of balance between production and wheel life. There has been no sacrifice of wheel life to get greater production. Speed of cut and freedom of cut have been increased. The whole technique of our foundry wheel structures has been revised—improved.

We are throwing on the foundry and billet grinding lines these new wheels to improve grinding conditions. They will lower costs throughout the entire industry—the steel, malleable, manganese and grey iron foundries—the stainless steel and iron and alloy plants—on every grinding task from the roughest of casting and billet grinding to those jobs where high finish is required.

Your foundry and billet grinding problems are ours. These new wheels, backed by our sales engineering service, offer definite solutions.

Visit our exhibit at the foundry show.

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Large Door Made For Archives Building

What is claimed to be the largest bronze door in this country recently has been completed by the John Harsch Bronze & Foundry Co., Cleveland. The door shown in Fig. 1 is one of two sections each 37 feet high, eight feet six inches wide and 11 inches thick at the sides. The total weight of each section is 5½ tons of which 3¾ tons is structural steel and the remainder bronze made up of rolled, extruded and cast shapes. The cast parts include the rosettes, the three transverse panels and the moulding.

Jambs for the doors are faced by the bronze panels shown in Fig. 2. Five of these panels appear on each jamb with one of the small square panels shown in the same illustration located between the ends of each pair. These panels are made from high zinc bronze mixture in which the color had to match that of the rolled and extruded parts. The design in relief is highly polished.

The long panels ¼-inch thick and provided with a rib one inch high extending around the perimeter at the back, were cast face down and gated at both ends and at both sides. Runner basins were placed over each sprue and were plugged until the basins were filled with metal. This precaution was observed to eliminate the wrinkles and worm track effect usually found in castings poured from high zinc bronze mixtures.

In the erected position the doors will be suspended from suitable hangers riding on ball bearings. Electrically operated mechanism will open and close the doors. An elaborate locking system will hold the doors in the closed position. This lock must be released in every detail, before the moving mechanism above starts to function. The two doors meet in the center of the doorway when in closed position and slide into pockets in the wall on either side when opened for traffic. The doors are for the new Archives building, Washington.

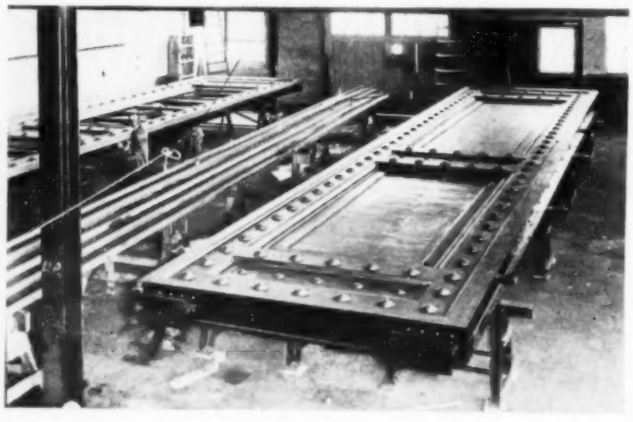

Fig. 1—One section of the large ornamental bronze door for the Archives building at Washington

Fig. 2—Bronze castings which face the jambs for the doors

Russian Foundry Brews Interesting Yarn

An interesting story regarding the operation of a tractor foundry in Russia was contained in a recent article in the *New York Times*, written by Harold Denny in Moscow. The entire affair and actions of the principals appears fantastic to the American, accustomed to meeting both production and labor problems in an entirely different manner. The story in part is as follows:

A trial of a sort which could be held only in Soviet Russia ended here today with the conviction of four men, three of whom are Communist party members, for harrying a foundry manager to his death by suicide a month ago.

The foundry manager, M. Leitin, also was a member of the Communist party. He was a sensitive, highly ambitious man, only 22 years old, whose devotion to his work had won him numerous bonuses and honors. When faulty castings were produced by the foundry, however, leading workers there unjustly blamed him. They organized a funeral parade headed by a coffin bearing the manager's name and photograph which so humiliated and horrified him that he killed himself.

The four men held responsible were the secretary of the Communist party organization at the foundry, the chairman of the foundry propaganda committee, the chairman of the factory committee and the representative of the union. They are all ardent young men, and the charges against them were not specific, but merely alleged they had not shown proper consideration to Leitin and had not helped him in his difficult tasks. They were brought to trial as examples in the campaign of the Soviet high command to foster ambition and leadership among young men of technical ability in contrast to the former hostility toward technicians. The Moscow City court room was jammed with fellow-workers of Leitin and the accused while witnesses told how the manager tried to carry out a rush order for a new type of tractor parts and worked night and day unavailingly to discover why a high percentage of castings were defective. The accused men were members of the commission named to investigate the trouble. Not having technical training, they did not discover the fact, which was brought out later, that the castings were bad because of improper materials sent to the foundry.

Though the four were found guilty the sentences were light. Three were sentenced to compulsory labor for terms ranging from five months to a year, which does not mean they will go to prison but only that they must do certain work without pay in addition to their regular jobs. The fourth defender was reprimanded and barred from holding a responsible post for a year.

Their real punishment is humiliation. The Communist party will decide later whether they are to be expelled.

Made Vice President

W. A. Watson, has been made vice president of the Stowe-Fuller Refractories Co., Cleveland. Mr. Watson was associated for 10 years with the General Refractories Co., Philadelphia, and recently has been district manager of that company's Detroit office.

Appointed Manager

R. X. Raymond has been appointed manager of the Minneapolis district office of the Chain Belt Co., succeeding G. A. Gunther who has been made district manager of the Detroit territory. The Minneapolis office is located at 808 LaSalle avenue, and the Detroit office at 5169 Martin avenue.

ADVERTISING PAGES REMOVED

Equipment Furthers Progress

(*Continued from page* 37)

the furnace structure and supporting the turns of the furnace coils more rigidly.

Electric Furnace Co., Salem, O., has developed a recuperative type electric furnace for annealing castings. In this type of unit, the heat from the outgoing material preheats the ingoing material, thus placing the annealing of castings on practically a continuous basis. The company also has designed a two-chamber fuel fired car type annealing oven providing a special method of firing. The charge is supported above the actual car top level, thus permitting the burners to be arranged so that all combustion takes place below the charge. It is claimed that this method of firing eliminates the cold car top, shortens the time required to bring the charge to temperature, and provides closer temperature uniformity throughout the charge. Continuity of operation is secured with a transfer car and three furnace cars.

Cupola for Long Heats

A hot-blast cupola, fired with pulverized coal, has been developed by the Whiting Corp., for application where long and continuous heats are necessary. Among the features claimed for that unit are lower fuel costs, higher melting rate, less oxidation, high tapping temperatures, and a more uniform control. To meet the particular needs encountered during the past few years, the company also has introduced a small cupola having a 27-inch diameter shell and a melting capacity of 2000 pounds per hour. In line with this development in melting units, the company has undertaken work in the duplexing of iron, where the metal is melted in the cupola and refined in the pulverized coal fired air furnace. Another development of that firm is a pulverized coal fired annealing oven in which, it is claimed, results which formerly required 7 days now may be obtained in 3½ to 4 days. Improvements in foundry ladles include the addition of ball bearings, positive lubrication, and an automatic brake to its helical worm geared tilting ladle mechanism.

A line of covered and insulated ladles which permit the handling and distribution of larger amounts of metal over a longer period of time has been a contribution of the Modern Equipment Co., Port Washington, Wis. An additional feature is the protection from heat and gases afforded the pouring crew. The cover is supported on a swivel bracket at the back and is designed to be raised and swung aside when the ladle is being filled.

Several developments have been made in the field of nonferrous melting. United Furnace Engineering Co., New York, has produced an oil-fired crucible type furnace in which it is claimed that almost perfect combustion of the fuel oil and the design of the burner and combustion space have resulted in highly efficient utilization of the fuel. The furnace atmosphere may be made either oxidizing, neutral, or reducing. The unit is produced in either stationary or tilting type, and is started or shut down by pushing a single-button switch. A stationary type crucible furnace for oil or gas fuel built to accommodate any size crucible from No. 20 to No. 100 has been placed on the market by the Campbell-Hausfield Co., Harrison, O. Operation of the furnace is said to require 2 gallons of fuel oil to melt 100 pounds of brass or bronze.

An interesting core oven installation has been made by the Crawford Oven Co., New Haven, Conn., The unit is a combination of lift truck rack oven and a drawer plate oven, the drawers being located above the combustion chamber in a space which cannot be used for rack loading. The particular installation, which is fired with oil, was developed for a plant which found it impossible to excavate the floor so that the combustion chamber could be placed below the oven. That company also has designed an oil-fired external heater for application to existing or new cores and mold ovens.

Foundry Equipment Co., Cleveland, has developed a rolling drawer type core oven which may be built in large sizes. A recent installation of that type has individual drawers 5 feet high and 10 feet long with six drawers per oven. A new vertical conveyor core oven of that company has racks with three shelves per rack. The loaded racks move up one side of the oven, through the baking zone, over a set of sprockets and down the opposite side through the cooling zone to the unloading position. The return curve of the conveyor is located below the floor level and a passageway is provided between the two vertical runs so that both sides of the rack are accessible for loading. A feature of that type oven is the small amount of space required. The company also has designed a heater for supplying hot gases to core and mold ovens in connection with recirculating systems. The heater may be located on the floor or on top of the oven.

Instruments for controlling furnaces and ovens have been developed. Foxboro Co., Foxboro, Mass., has introduced a new automatic air weight controller designed for use with practically any type of blowing equipment. When used to control air flow to the cupola, an orifice plate or other primary device is installed directly in the blast pipe. The instrument operates a controlled valve that automatically maintains delivery of the desired weight of air. Taylor Instrument Companies, Rochester, N. Y., has designed a recording regulator for temperature, pressure, rate of flow, and liquid level control.

Cleveland Quarries Co., Cleveland, has introduced its silica firestone for use in lining cupolas, bessemer converters, and for air furnace bottoms. That company has developed a method of lining which consists of using a wedge shaped stone block in the melting zone with allowance for expansion on preliminary heating. As soon as the blocks have burned back sufficiently, a slab lining or resurfacing of silica firestone split rock is placed in the melting zone completely covering the stone blocks.

Relining that type is repeated as often as required. It is claimed that the firestone holds up under severe service and that it is possible to maintain a fixed diameter in a cupola with greater ease.

Makes Special Brick

Special pulverizing, pressing and burning methods have permitted the Illinois Clay Products Co., Joliet, Ill., to produce cupola blocks and ladle brick of the desired density and possessing special resistance to spalling caused by temperature variations. That company also has introduced pulverized plastic fireclays for bonding moldings and in gray iron, steel and malleable foundries. In addition, the company has developed a high temperature product for insulating open-hearth furnace walls. It is claimed that fuel savings range from 10 to 20 per cent and that refractory life in most instances is benefited, due to a reduction in velocity of gases passing through the furnace.

Developments in the field of molding sand handling and preparing equipment reflects the interest always displayed by foundrymen in that subject. Royer Foundry & Machine Co., Kingston,, Pa., has developed a combination scrap remover and sand separator and blender designed particularly for iron and steel foundries. In operation the sand is carried to the hopper by buckets. The hopper has a hogback grate which breaks the drop of the sand, and a walking grate located underneath the hogback removes wedges, gaggers, and other foreign material. The sand then is fed into the separator and blender where it is aerated. The separator and blender is built in two sizes with capacities of 30 and 50 tons of sand per hour.

National Engineering Co., Chicago, has developed an aerator unit for attaching to the discharge end of its muller type sand mixer. The unit has a rotating drum with angular toothed combing bars for aerating the sand. That company also has introduced numerous changes in the design of its mulling type sand mixer. Antifriction bearings are provided on the

vertical shaft and mullers and the vertical shaft is operated in a bath of lubricating oil. Mullers are offset on each side of the center line to increase the mulling and rubbing action, and are adjustable to prevent grinding of the materials. Use of a two-way plow beam and boiler plate outside plow simplifies plow adjustment. Crib fillets have been added in the corner of the crib and wearplates to prevent the building up of sand at that point. The height of the turret has been increased to provide greater clearance of the sand.

A continuous type sand blending machine of the revolving drum type has been announced by the Standard Sand & Machine Co., Chicago. The revolving drum is fitted with lifting flights. Sand delivered in a hopper at one end of the drum is lifted and dropped on a pair of rolls progressively as it proceeds through the drum. The rolls are fitted with broad scrapers, forming a hopper, so that all of the sand is directed through the rolls. The drum is mounted on a heavy cradle with hand wheel control, so that the inclination of the drum can be changed to increase or decrease the volume and mixing time.

Mixed in Revolving Pan

A sand mixing unit with a loading hopper attachment has been developed by the Lancaster Iron Works, Lancaster, Pa. The mixer consists of a pan revolving in a clockwise direction, a mixing spindle with its mullers and plows revolving in a counter-clockwise direction, and stationary marginal plows. In the mixing operation, the material in the pan is carried in a clockwise direction until it meets the counter-clockwise rotation of the mixing spindle equipment. During the travel of the material, permanent bottom and side marginal plows lift and turn the material or divert is into narrow troughs to be picked up again, turned and carried forward by the spindle.

A portable type unit for screening, blending, aerating and piling sand has been introduced by the Beardsley & Piper Co., Chicago. In operating the unit, sand is shoveled on a corrugated screen which breaks up the lumps and screens out and discharges refuse, gaggers, cores, and other sand contamination. The sand dropping through the screen is discharged from the unit into a pile, the operation being accomplished by a rotor. That company also has developed a shakeout which consists of three parts, namely, a cylinder, a piston and a hammer head. Air is introduced at the bottom of the cylinder, causing the piston to rise and impart sharp blows at the hammer head, which in turn transmits the vibration to the flask. Under normal operation the flask receives from 1800 to 2200 vibrations per minute. A special oiler device has been developed to keep the pistons properly lubricated.

A small, rugged and compact foundry sand aerator has been designed for medium capacity sand preparation installation by the Link-Belt Co., Chicago. The machine breaks up pellets and produces an aerated molding sand through the action of flat steel beater arms or paddles secured to an antifriction, roller-bearing mounted main shaft. Paddles are set at such an angle as to drive streams of sand forward across each other and across the center line. A curtain of suspended chains at the discharge, prevents any particles passing through in a straight line.

That company also has made improvements in its portable belt conveyor which operates on 21-foot centers and employs a rubber belt 18 inches wide. A new design of bucket elevators of that company features a heavy back, heavy lift, reinforced corners, front reinforcing ribs, and is made of a special strong, long-wearing metal, A shaft coupling, flexible and simple in design, also has been developed by that company.

Simplicity Engineering Co., Durant, Mich., has produced a shakeout screen and a gyrating screen for foundry use. Each unit is constructed along identical lines, operating at a speed of 1200 revolutions per minute, with the vibrations produced by the counter-balance eccentric gyrating shaft. In the shakeout-type screen, the eccentric bearing housings are water cooled. Screens are mounted on resilient rubber corner supports to aid in operation without external vibration.

Deister Concentrator Co., Fort Wayne, Ind., has made several changes in design of its vibrating type foundry screens. The screen is mounted on wheels and is moved along the shakeout floor to aerate and screen the sand, remove gaggers, shot, iron, nails, and other refuse. The vibrating screen is mounted at an angle, and when the sand is shoveled onto the screening surface, the refuse travels down the inclined screen surface and is collected in a removable waste box at the bottom. The vibration rate is 1200 per minute. That company also has developed a spray nozzle which can be used for air or other gases, and water. The flow from the nozzle is delivered in an unbroken sheet stream. Its uses in the foundry are for blowing off patterns and for tempering sand.

Productive Equipment Corp., Chicago, has produced a line of screens which may be used in floor operations or in connection with other sand handling or sand conditioning equipment. The screens are designed to operate at a speed sufficiently high to eliminate binding. The cloth may be changed quickly, but the angle of the screening surface may be adjusted to handle the particular type of sand, as governed by the moisture and clay content. The screens are equipped with a compound eccentric permitting adjustments of throw or amplitude vibration. Screens are mounted on rubber to eliminate transmission of vibrations to the superstructure.

C. O. Bartlett & Snow Co., Cleveland, recently installed a sand handling and preparing plant which is arranged to handle both steel castings and iron castings with the same molding machines and on the same floor. However, both types of work are not made on the same day. A feature of the installation consists in two preparation plants, one for steel, and one for iron sand, and separate shakeouts. Sand from either may be delivered to the molding machine at the will of the operator.

Sand Blown in Coreboxes

Trend toward blowing cores in production shops is indicated by several developments in core blowing machines. Wm. Demmler & Bros., Kewanee, Ill., has produced a larger sized core machine for making cylinder heads, manifolds, tappet housings, water jackets, cylinder blocks and transmission housing cores. The machine has a capacity sufficient to make cores for straight eight cylinder motor blocks. The unit is equipped with semiautomatic operating valve which controls the various operations of the machine in sequence. The machine may be equipped with a motor-driven sand feeding device to insure a constant flow of sand in the hopper. Another machine of that company is built especially for 8-cylinder automobile cores and is designed to provide a flow of sand above the entire core.

A new core machine of the International Molding Machine Co., Chicago, is designed to blow cores up to 25 pounds in weight. An operating valve controls the complete sequence of operations through one full movement of the lever. The table may be removed and replaced quickly when a change of corebox makes that operation necessary. Clamps are rigid and arranged to provide parallel clamping surfaces on the corebox. The machine is constructed in small, medium and large sizes and is supplied with a standard sand container and core blower plate to blow a box having core surface up to 7 x 14 inches.

A core blowing machine designed to produce cores of uniform porosity and density at high speeds has been introduced by the Osborn Mfg. Co., Cleveland. A feature of the design is the automatic valve which controls all operations in sequence, following the movement of the lever by the operator, and provides a definite time allowance for each operation. A safety valve located on the top portion of the machine must be actuated by the left hand of the operator while the operator's right hand is moving the master valve. This prevents possible injuries to the operator's hand while the sand chamber is moving into the

(*Continued on page* 88)

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QUALITY · SERVICE · DEPENDABILITY

Ferro-Chromium

In grey iron, it is established that 0.5% Chromium in the presence of 1 to 2% Silicon increases the tensile and transverse strength and hardness.

Chromium has a definite application in the field of heat-resisting irons because Chromium irons show little growth under conditions of repeated heating and cooling, due to the formation of a more stable carbide of iron and Chromium.

For additions of Chromium to grey iron in the cupola, we recommend Philo Brand Special *Cupola Lump* Ferro-Chromium.

For additions of Chromium to grey iron in the ladle, we recommend Philo Brand Special *Ladle* Ferro-Chromium in preference to Standard Ferro-Chromium, for the following reasons:

1. Its melting point is approximately 150 degrees lower.
2. The Chromium recovery is higher.
3. A more uniform distribution of Chromium is assured.

Should any questions arise concerning the use of Philo Brand Ferro-Alloys in solving your particular problems, or should you desire our metallurgical advice, we invite you to consult our Metallurgical Service Department.

Ohio Ferro-Alloys Corporation

CHICAGO *Canton, Ohio* DETROIT

Plant at PHILO, OHIO

(*Continued from page* 86)

blowing position. A large sand chamber is provided to permit an even flow of sand. This machine may be supplied with a more recently developed motor-driven feed mechanism which receives sand from a down spout or a sand elevator. A convenient push button control operates the feed mechanism.

In the field of molding machines, a wide variety of types have been developed from the simple squeeze unit to the more complicated mechanisms performing a number of operations in the molding cycle. One of the latter is the cope drag, jolt, rollover, squeeze, pattern draw and closing machine produced by the Osborn Mfg. Co. That machine handles flasks 28 x 42 inches inside with combined cope and drag height up to 14 inches, divided as desired between cope and drag. One operator can handle flasks and patterns, roll the mold over, drag the pattern, and deliver the finished mold from the machine. A second machine of that company is a jolt squeeze molding unit designed to give higher squeeze pressure from a 12-inch squeeze piston. An adjustable automatic squeeze pressure release valve regulates the desired hardness of the mold. The post type head may be moved easily as it is supported on a ball type bearing. A third unit is a jolt squeeze stripper molding machine, designed to handle a flask up to 30 inches in length and 24 inches in width. Another development is a jolt, rockover, pattern draw molding machine which features a single cylinder air operated rockover mechanism. Both rollover and rollback operations are controlled by a single operating valve design.

Machine Has Long Draw

International Molding Machine Co., Chicago, recently installed a machine for molding transmission cases for tractors. That type machine has two large air cylinders located in the center to raise the pattern in position ready for ramming, and by exhausting the air, to draw the pattern downward out of the mold. Maximum draw on the machine is 20 inches. Stops are provided to adjust the draw for variations in the height of patterns. Pattern equipment and flask for which both the cope and the drag machines were designed, are heavy, the flask measuring 5½ x 7 feet, while the total depth of the cope and drag is 46 inches. The machines are designed for use in a pit. A set of heavy-duty vibrators specially designed and mounted, operate automatically while the pattern is being drawn.

Herman Pneumatic Machine Co., Pittsburgh, has contributed a high-speed jar, rollover and pattern drawing molding machine, upon which further improvements recently have been made. A new operating stand has been designed and the machine has been equipped with an automatic fluid timing valve, air clamps, which are adjustable in and out as well as up and down to take care of different widths and heights of flasks, and roller conveyor on which the finished mold automatically is deposited. The company also has developed a pitless type high-speed jar rollover and pattern drawing molding machine of 1500 pounds capacity. No pit is required for this unit and necessary repairs may be made from the top of the machine. Both types of machines are built in a variety of sizes.

A combination jar, rollover and post type squeezer molding machine has been developed by the Tabor Mfg. Co., Philadelphia. The rollover member has a table 14 x 16 inches and will handle flasks up to 14 x 30 inches. The machine is equipped with a hand-operating flask clamp and a simple mechanism for leveling the molds preparatory to drawing the pattern. The company also has introduced a machine for rapid production of molds, which utilizes a jar to ram the sand uniformly and quickly. A positive mechanical draw is produced by air admitted on oil. The company also has developed several additional machines which will be announced shortly.

A machine having an air jolt, hand rollover and foot draw has been introduced by the Arcade Mfg. Co., Freeport, Ill. This machine, having a jolt capacity of 300 pounds, has a table 18 x 18 inches and accommodates a flask up to 18 inches in width. Allowance for depth of flask, pattern plate and bottom board is 11½ inches.

With foundrymen constantly striving for greater control of manufacturing operations and products, it is natural that the various types of testing equipment should appear in the story of progress. A wide variety of sand testing equipment has been made available by the Harry W. Dietert Co., Detroit, including a tensile sand strength accessory for a universal sand strength machine, a gas tester to determine the quantity of gas given off by molding materials when heated to high temperatures, a rotating sand washer for determining percentage of clay substance in molding sand, a drying unit for rapid drying of sand samples to determine the percentage of moisture, a machine for measuring the green tensile bond strength of molding sand, and a testing oven for baking test cores or dry sand specimens and for drying sand samples.

Bausch & Lomb Optical Co., Rochester, N. Y., has done considerable work in the application of the spectrograph as a piece of equipment for analytical laboratories. Use of that type of equipment may be confined to the qualitative examination of materials for purposes of identification, to test for the presence or absence of specific constituents or as a guide for the chemical analyst in the collection of suitable methods and in checking the completeness of the separation. Sometimes its use is extended to include quantitative analysis either for impurities or essential minor and minute constituents of materials.

General Electric X-Ray Corp., Chicago, has installed one of the newest types of equipment for the investigation of castings. The unit, which is being operated in a large steel foundry, employs the highest voltage now utilized in this particular field of inspection.

Pyrometer Has Three Scales

An optical pyrometer of the Pyrometer Instrument Co., New York, incorporates three separate reading scales. One reads from 1400 to 2000 degrees Fahr., a second scale reads from 1800 to 3400 degrees Fahr., and a third scale ranges from 2200 to 3600 degrees Fahr., corrected for direct reading of true spout and pouring temperatures of molten iron and steel when measured in the open.

Since numerous items previously described require compressed air as a source of power, it is consistent that developments in air compressing equipment should be found. Ingersoll-Rand Co., Phillipsburg, N. J., one horizontal double-acting cylinder available in sizes from 10 to 25 horsepower for discharging pressures from 5 to 150 pounds. This machine is suitable wherever full-load continuous service is required and for isolated plants where there is little supervision. Regulating equipment suitable for any conditions of service may be supplied. The company also has produced a new type of air compressor which requires no cooling water, and in which the motor rotor is carried on the compressor shaft and the motor frame is bolted directly to the compressor crankcase. Curtis Pneumatic Machinery Co., St. Louis, is announcing a new model 2 and 4-cylinder compressor in the near future.

A new compressed air drying system which combines an after-cooler, a moisture expeller, and on automatic drain trap, has been developed by the Ruemelin Mfg. Co., Milwaukee. The after-cooler removes the heat from compressed air by a counterflow of the air and cooling water, the expeller removes all water and oils suspended in a free state, and the drain automatically discharges the concentrate into the sewer connection. James A. Murphy & Co., Hamilton, O., has developed a unit for cooling air immediately after compression, before or after entering the receiver, but before it enters the piping system. The device reduces the temperature to a point where the water and oil are condensed, the residue being removed

(*Continued on page* 90)

A COMPLETE SAND SERVICE

No matter where your foundry is located, there's always a Standard Silica distributor to serve you speedily and intelligently.

Black Hawk Blast Sand is entirely free from dust and the grains are hard and sharp. A smooth, uniform finish on your castings is the result.

On all your requirements for blast sand you will find Black Hawk Blast Sand flows freely, cleans fast and gives maximum efficiency from your blast equipment with minimum air cost.

Insist on BLACK HAWK Blast Sand

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Manley Sand Company
Rockton, Ill.
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AT SEATTLE
Western Foundry Sand Co.
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Seattle, Wash.
serving Northwest

AT LOS ANGELES
Snyder Foundry Supply Co.
2435 E. 58th St., Los Angeles, Calif., serving Southern California and Arizona

Standard Silica Is Ottawa Silica at its Best

(*Continued from page* 88)

by a hand drain or preferably by an automatic trap.

Since the movement of materials constitutes one of the important problems in foundry operation, considerable attention has been paid to several types of material handling equipment. Yale & Towne Mfg. Co., Philadelphia, has developed a low-lift truck with a rated capacity of 10,000 pounds. The truck has six wheels, four 10½ inches in diameter and 6 inches wide directly under the load platform in addition to the two 20-inch diameter by 6-inch wide driving wheels under the battery compartment. A new type finger-lift power truck that has long steel fingers which are slipped under any cleated load having two inches or more underclearance, has been designed by the Clark Tructractor Co., Battle Creek, Mich. The company has developed four new models of tilting and tiering trucks of 2 to 3 tons capacity with 48 and 60 inch wheelbase. These trucks insert steel fingers under the load, tilt it back 5 degrees to a safe carrying position and then move at a rate of 1 to 6 miles per hour. They tier at heights ranging from 50 to 74 inches, tilting the load forward as much as 20 degrees to facilitate placing.

Charge Annealing Ovens

A new truck of the Baker-Raulang Co., Cleveland, has been designed especially for charging annealing ovens in a malleable foundry. Height of load and the low oven door limit the underneath clearance to approximately 5 inches, thus necessitating the use of a truck of the overhanging fork-type in which, in the low position, the fork lies close to and parallel to the floor. In operation the forks rise about 6 inches and tilt simultaneously.

American Monorail Co., Cleveland, has produced a motor-driven trolley which features the use of an air-filled or live rubber wheel to drive the bottom of the monorail section. The high coefficient of friction between the wheel and the rail is said to give a nonslipping grip against the steel rail section, resulting in a powerful drive unit. A tramrail sliding switch, which is claimed to minimize the necessity for superstructure, has been introduced by the Osborn Mfg. Co. The unit is designed so that the curved section and the straight section are welded to the sliding plate which moves to either position of the switch on four rollers mounted on the switch frame. A latch at either end on the upper side of the sliding plate keeps the switch locked in position.

Jeffrey Mfg. Co., Columbus, O., has developed a line of belt idlers claimed to provide belt protection, long reliable service and power economy. Outer shells of the rolls are made of high quality steel tubing, with full thickness of walls throughout the entire length. Oversized tapered roller bearings of the self-aligning type are used. Electric Storage Battery Co., Philadelphia, has introduced a form of vulcanized rubber sheet for separators in its storage batteries. This material, which is permeated with countless microscopic passages, permits free diffusion of the electrolyte.

A silvery iron containing from 9 to 12 per cent silicon, from 2 to 3 per cent manganese, phosphorus under 0.10 per cent and sulphur under 0.5 per cent has been introduced by the Bethlehem Steel Co., Bethlehem, Pa. The iron contains from 2.50 to 3.00 per cent chromium, 1.00 to 1.5 per cent nickel, and 1.60 to 2.00 per cent total carbon. It is claimed that mixtures using up to 80 per cent steel scrap and 15 to 25 per cent of the silvery iron will make castings showing high tensile strength values combined with machinability in light and heavy sections. The castings can be heat-treated in oil or water to 550 to 600 brinell and then drawn to any desired brinell hardness.

Ajax Metal Co., Philadelphia, has developed a number of new nonferrous alloys including an aluminum bronze, a nickel alloy, and an aluminum alloy.

Titanium Alloy Mfg. Co., Niagara Falls, N. Y., has developed a low carbon ferrotitanium containing about 18 to 20 per cent titanium, 18 to 20 per cent silicon, less than 0.5 per cent carbon and less than 1.00 per cent aluminum. In addition to acting as a deoxidizer and fluxing agent for nonmetallic impurities, it is claimed that the ferrotitanium refines the size of the graphite flakes, giving a closer grain, stronger iron of low porosity, and more resistance to the heat.

While 4 years ago the commercial application of molybdenum iron was exceedingly limited, the development work of the Climax Molybdenum Co., New York, has succeeded in exploring a large number of commercial applications for that alloy today. It is pointed out that molybdenum is a most effective alloy element in improving physical properties in iron, may be used in cast iron for nitriding, and that the alloy enters the carbides of iron, thereby toughening them.

Interest in the use of fused soda ash in the foundry, both in the United States and abroad, has been furthered through the research work of the Mathieson Alkali Works, New York. Desulphurizing metal by that method first was limited to iron for heavy castings, where an appreciable loss in temperature was permissible. Improvements in ladle and forehearth equipment and in methods of carrying out the process have resulted in reducing temperature losses to a minimum and the practice gradually has extended into the lighter casting shops. In the nonferrous field the Maluminum Co., Indianapolis, has developed a brass flux for eliminating the carbon pickup from the electrodes of an electric furnace. The company has also produced a flux for casting bronzes, where the temperature of the molten bronze runs from 2200 to 2300 degrees Fahr.

A briqueting machine, having a simple feed and stripping mechanism, and operating under 1500 pounds oil pressure, has been developed by the Milwaukee Foundry Equipment Co., Milwaukee. As the stroke of the machine is not fixed, but the machine is reversed at a fixed pressure, each briquet is subject to the same pressure irrespective of length. It is pointed out that the briquets have a density of approximately 85 per cent of cast iron.

R. G. Haskins Co., Chicago, has designed two new tapping machines. Range of the tappers overlap, from No. 10 up to and including $\frac{5}{16}$-inch in steel, ⅜-inch in cast iron and $\frac{7}{16}$-inch in brass and other nonferrous metals.

Air Reduction Sales Co., New York, has developed new pressure regulators for application in oxyacetylene welding and cutting. The company has also developed a portable tensile and bend testing machine for determining strength of welds. The operator can apply a direct load up to 40,000 pounds and by using specimens of smaller cross-sectional areas than the maximum 1½ x ½ inches, loads equivalent to 150,000 pounds per square inch or higher can be applied.

Make Heavy Steel Flasks

New equipment has enabled the Truscon Steel Co., Cleveland, to produce pressed steel flasks from material ½-inch thick. It is pointed out that using metal of that thickness permits the production of flasks in larger sizes. The company has made flasks as large as 6 feet wide and 9 feet long with sections as high as 36 inches, the ½-inch material being used for that purpose. The company also has installed equipment to electric buttweld all sizes of flasks. A line of aluminum flasks and jackets incorporating numerous interesting features, has been designed by the Hines Mfg. Co., Cleveland. A continuous sand strip is operated with a new device constructed without springs or complicated mechanism. Two operating levers, located at the two opposite corners of the flask, are designed to prevent sand from entering the strip operation mechanism. Weight has been reduced through a cross-ribbed design on the side of the flask. The units are built on jigs and the parts are interchangeable. Shanafelt Mfg. Co., Canton O., has made improvements on its line of one piece, all steel flasks which are built in any type, shape and size required in thickness from $\frac{3}{16}$ to ⅜-inch inclusive.

Smith Oil & Refining Co., Rockford, Ill., has announced a new line of synthetic core oils which contain no rosin, and which, it is claimed, reduce the baking time 15 to 25 per cent. Fur-

(*Continued on page* 93)

ADVERTISING PAGES REMOVED

(*Continued from page* 90)

ther claims include increases in permeability of core sand and elimination of burning in or washing when the hot iron is poured on the cores. Hercules Powder Co., Wilmington, Del., has developed a resinous binder which remains in the powdered form under usual temperature and humidity conditions during storage. Cores made from this dry binder are said not to absorb moisture with consequent loss in strength and that the resultant cores are smooth. The binder may be used for making cores for aluminum, bronze, brass, steel and iron castings. When the binder is used with linseed oil, an appreciable increase in strength is obtained. Corn Products Refining Co., has installed a foundry laboratory with a core sand mixer, ovens and testing devices. Considerable work is being done in the control of its products, and in the solution of problems pertaining to the use of core binders.

Franklin Core Rod and Gagger Co., Franklin, Pa., has developed a twisted steel tumbling barrel star which has eight points and 12 cutting edges. It is claimed that due to the individual shape, the stars react with one another in the tumbling barrel into a twirling, scraping and cleaning mass, providing quicker and more thorough cleaning. A line of grooved, square twisted steel gaggers, in sizes ⅜, ½ and ⅝-inch, single and double bend to any dimensions of leg, toe or hook desired has been developed by the Franklin Steel Works, Franklin, Pa.

Chill coils, made in two styles, one with the tail inside the spiral and the other without a tail inside, have been developed by the J. S. McCormick Co., Pittsburgh. The chills are made in

Key to Illustrations in Article on Equipment Furthers Foundry Progress

No.
1—Detroit Electric Furnace Co., Detroit.
Safety switch and magnetic brake motor on electric furnace.
2—Standard Sand & Machine Co., Chicago.
Continuous type sand mixing machine.
3—Whiting Corporation, Harvey, Ill.
Tube type dust arrester.
4—Tabor Mfg. Co., Philadelphia.
Jar ram type molding machine.
5—Ajax Furnace Corp., Trenton, N. J.
Induction type melting furnace.
6—Beardsley & Piper Co., Chicago.
Sand screening and aerating equipment.
7—Electric Furnace Co., Salem, O.
Recuperative type electric annealing furnace.
8—Modern Equipment Co., Port Washington, Wis.
Covered pouring ladles and pouring equipment.
9—Milwaukee Foundry Equipment Co., Milwaukee.
Briqueting machine.
10—W. W. Sly Mfg. Co., Cleveland.
Pneumatic abrasive separator.
11—International Molding Machine Co., Chicago.
Molding machine for tractor transmission cases.
12—Wm. Demmler & Bros., Kewanee, Ill.
Core blower equipped with sand feeding device.
13—National Engineering Co., Chicago.
Muller type sand mixing machine.
14—Bridgeport Safety Emery Wheel Co., Bridgeport, Conn.
High speed stand type grinder.
15—Arcade Mfg. Co., Freeport, Ill.
Molding machine of air jolt, hand rollover, foot draw type.
16—The Deister Concentrator Co., Ft. Wayne, Ind.
Sand screen.
17—Herman Pneumatic Machine Co., Pittsburgh.
Jar, rollover, and pattern draw molding machine.
18—Foundry Equipment Co., Cleveland.
Rack type core oven.
19—Ingersoll-Rand Co., New York.
Air compressor.
20—Royer Foundry & Machine Co., Kingston, Pa.
Combination scrap remover and sand blender.
21—Pittsburgh Lectromelt Furnace Corp., Pittsburgh.
Direct arc furnace with swing aside roof.
22—Illinois Clay Products Co., Joliet, Ill.
Specially insulated open hearth furnace.
23—Detroit Electric Furnace Co., Detroit.
Indirect arc type furnace with door operated by lever.
24—General Electric X-Ray Corp., Chicago.
X-ray installation in large steel foundry.
25—W. W. Sly Mfg. Co., Cleveland.
Tumbling mills designed with roller bearings.
26—Clark Tructractor Co., Battle Creek, Mich.
Finger-lift industrial power trucks.
27—Whiting Corp., Harvey, Ill.
Powdered coal fired, quick anneal furnace for malleable.
28—Electric Furnace Co., Salem, O.
Two chamber, fuel fired, car type annealing furnace.
29—American Monorail Co., Cleveland.
Motor driven trolley with rubber wheel.
30—R. G. Haskins Co., Chicago.
Tapping machine.
31—Tabor Mfg. Co., Philadelphia.
Combination jar, rollover and post type squeezer molding machine.
32—Herman Pneumatic Tool Co., Pittsburgh.
Jar, rollover and pattern draw molding machine.
33—Bausch & Lomb Optical Co., Rochester, N. Y.
Spectograph for qualitative analysis.
34—United Furnace Engineering Co. Inc., New York.
Oil fired, crucible type furnace.
35—United States Electrical Tool Co., Cincinnati.
High speed stand type grinder.
36—Campbell-Hausfeld Co., Harrison, O.
Stationary type crucible furnace for oil or gas.
37—Beardsley & Piper Co., Chicago.
Flask shakeout equipment.
38—Simplicity Engineering Co., Durand, Mich.
Vibrating sand screen.
39—Link-Belt Co., Chicago.
Portable belt conveyor.
40—N. Ransohoff Inc., Cincinnati.
Tumbling barrels to eliminate manual handling of stars.
41—National Engineering Co., Chicago.
Aerator unit for discharge of muller sand mixer.
42—Johns-Manville, New York.
Asbestos core plates.
43—Oliver Machinery Co., Grand Rapids, Mich.
Wood working lathe.
44—Foxboro Co., Foxboro, Mass.
Automatic air weight controller for cupola.
45—Harry W. Dietert Co., Detroit.
Tensile sand strength accessory.
46—Lancaster Iron Works, Lancaster, Pa.
Sand mixer with loading equipment.
47—Pittsburgh Lectromelt Furnace Corp., Pittsburgh.
Laboratory type direct arc furnace.
48—N. A. Strand & Co., Chicago.
Portable type flexible shaft machine.
49—Buckeye Portable Tool Co., Dayton, O.
High frequency portable electric grinders.
50—Rotor Air Tool Co., Cleveland.
Portable grinder with cone shaped wheel.
51—Harry W. Dietert Co., Detroit.
Rotary sand washer for determining percentage of clay.
52—Production Equipment Co., Chicago.
Double deck type vibrating sand screen.
53—Crawford Oven Co., New Haven, Conn.
Combination lift truck, rack and drawer type core oven.
54—Osborn Mfg. Co., Cleveland.
Core blowing machine with automatic sand feeding mechanism.
55—Great Lakes Foundry Sand Co., Detroit.
Alloy sand blast nozzle and liner.
56—Hines Mfg. Co., Cleveland.
Aluminum taper flasks.
57—Link-Belt Co., Chicago.
Foundry sand aerator.
58—Osborn Mfg. Co., Cleveland.
Cope, drag, jolt, rollover, squeeze, pattern draw and closing molding machine.
59—Pulmosan Safety Equipment Co., Brooklyn.
Respirator for protection against dust.

a large variety of sizes. The company also has introduced a new core compound which it is claimed makes a strong core that will clean out easily and bake at a low temperature.

Smith & Richardson Mfg. Co. has completed a number of new items in its line of chaplets, including plates for shell chaplets, standardized hinge tubes with tube-lock so it cannot turn, screw shell for ⅛-inch pipe thread used on pressure fittings, round lug tin used on grate bar castings, and babbitt anchors for castings that are to be babbitted. Shanafelt Mfg. Co., Canton, O., has introduced a new line of chaplets made of special metal having ribs cut on the stems to facilitate fusing. The chaplets are made in practically all sizes, ¾-inch diameter stems and smaller, all lengths and widths, square and round heads.

Additional protection is provided foundry workers in a safety type shoe which has been developed by the Safety First Shoe Co., Holliston, Mass. The steel safety toe box of these shoes are claimed to withstand pressures of about 2000 pounds, but in laboratory tests have withstood pressure of 4700 pounds. A line of respirators designed to provide protection against dust in all operations in foundries has been announced by the Pulmosan Safety Equipment Co., Brooklyn, N. Y. The units have a filter 3 inches in diameter, and a noninflating rubber faced cushion to provide proper fit and give comfort to the wearer.

During the past 2 years, many foundries have found the vacuum principle valuable in removing dust and dirt in the plant. Recently the Invincible Vacuum Cleaner Mfg. Co., Dover, O., has introduced a portable industrial vacuum cleaning machine on which two sets of cleaning tools may be used at the same time. Dust is collected in a metal container which is operated by a foot lever for easy emptying. A heavy-duty industrial model vacuum cleaner, equipped with standard attachments for plant cleaning purposes, has been developed by the Breuer Electrical Mfg. Co., Chicago.

A core plate made of specially compounded and treated asbestos in sheet form has been a contribution of the Johns-Manville Corp., New York. The material is supplied in sheets 36 x 48 inches, and ¼, $\frac{5}{16}$, ⅜ and ½-inch thick, or in rectangular cut pieces to meet the special needs of the foundry. Lightness of the plate and resistance to breakage and warpage are features claimed for the new material.

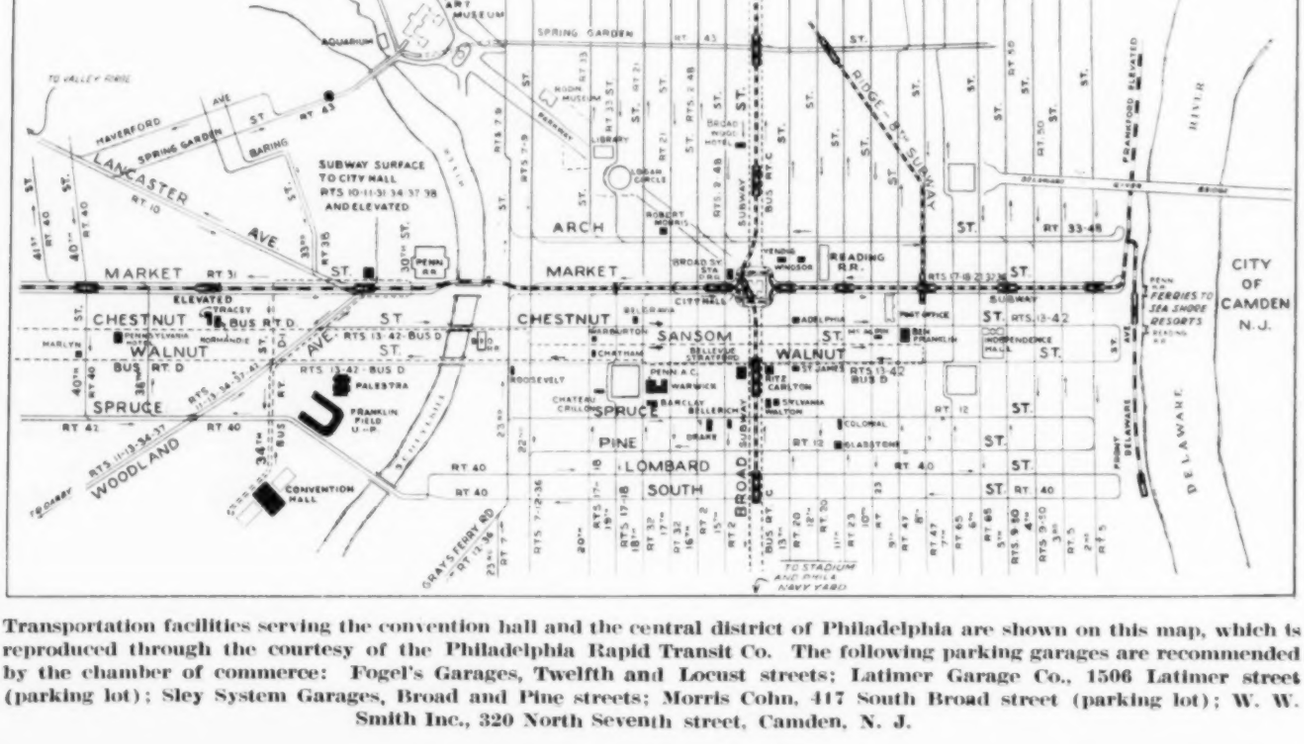
A number of wood-working machines have been introduced by the Oliver Machinery Co., Grand Rapids, Mich. The most recent development is a motor headstock lathe which operates any speed from 600 to 3600 revolutions per minute. The entire controlling mechanism is contained in the motor. Cling-Surface Co., Buffalo, has developed a belt preservative for transmission belts.

Discuss Government Apprentice Plans

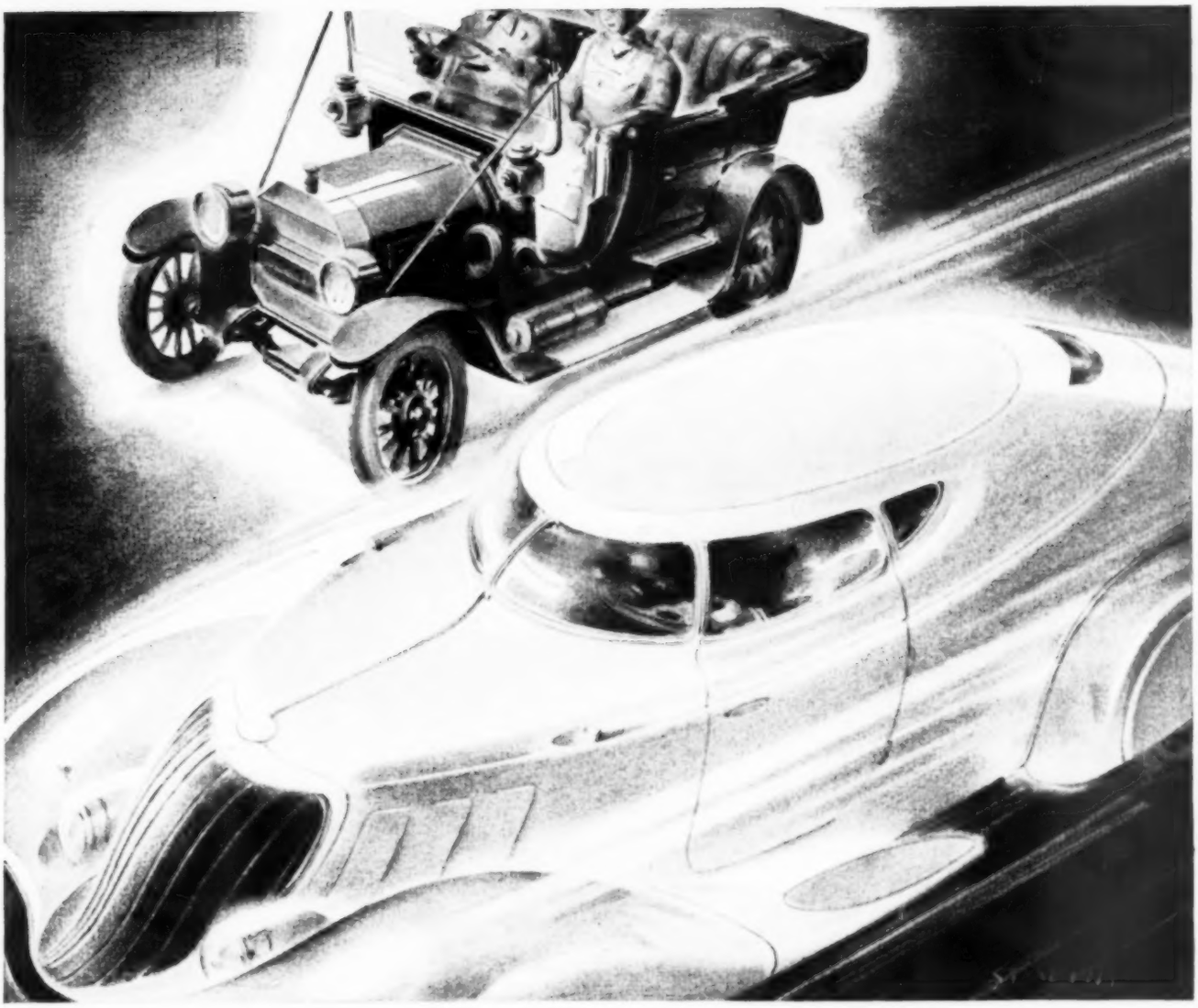
W. E. PATTERSON, designated as executive secretary of the Federal committee on apprentice training to set in motion the plans for introducing apprentice training as a phase of N.R.A. code administration will address a special apprentice training session of the annual convention of the American Foundrymen's association, Tuesday afternoon, Oct. 23. The government's program for fulfilling Executive Order 6750-C contains many important features of vital interest to the foundry industry. Mr. Patterson, who has been conducting conferences with state personnel and employment departments and who formerly was connected with the Milwaukee Vocational Training system, is fully informed on all phases of this activity.

Hears Talk On Chromium

J. H. Critchett, vice president Union Carbide and Carbon research laboratories, New York, was the guest speaker at the first regular meeting of the Chicago chapter of the American Society for Metals held Sept. 13 at the Medinah Club, Chicago. Mr. Critchett spoke of some of the past and present uses of chromium and also made predictions as to the increased use of that metal in the future.



Transportation facilities serving the convention hall and the central district of Philadelphia are shown on this map, which is reproduced through the courtesy of the Philadelphia Rapid Transit Co. The following parking garages are recommended by the chamber of commerce: Fogel's Garages, Twelfth and Locust streets; Latimer Garage Co., 1506 Latimer street (parking lot); Sley System Garages, Broad and Pine streets; Morris Cohn, 417 South Broad street (parking lot); W. W. Smith Inc., 320 North Seventh street, Camden, N. J.



WITH MOTOR CARS AS WITH GRINDING yesterday's speeds won't do

Illustrated above is a typical snagging operation with a Bakelite Resinoid Bonded High Speed Wheel.

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Cars of the "Horseless Carriage" era met the need of their time—but only a high speed streamlined car can meet the demand of today. Likewise the grinding machines and abrasive wheels of a decade or two ago cannot match the economics of present day high speed equipment and wheels. ¶ With the development of abrasive wheels bonded with Bakelite Resinoid grinding practice entered a new period. The remarkable strength of these new wheels made it possible to operate at higher speeds with safety. These greater speeds, as high as 16,000 S.F.P.M. on cut-off work, make practical high production schedules at lower cost. Consult any leading abrasive wheel manufacturer★ about Bakelite Bonded wheels for your type of grinding work. ***Write for Booklet 15G, "High Speed Abrasive Wheels."***

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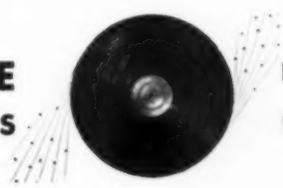
BAKELITE BONDED WHEELS



FOR HIGH SPEED GRINDING

Foundry Melts 2000 Tons a Day

(*Concluded from page 44*)

to unoccupied areas on the company's property. The water drains away or is evaporated and the deposit of sand is built up to any required height. In this condition it is allowed to weather for several months. Later as required this homogenous material is dug up with a steam shovel, loaded on cars and taken to the sand storage bins at the foundry. Mixed with a certain amount of clay bond it is fed into the sand system which circulates through the various molding departments. Samples of sand taken at hourly intervals throughout the day furnish a close check on operating conditions.

Slag from the cupolas is loaded in buggies and dumped on an area beyond the iron storage yard. Further cost of disposal is eliminated through the action of city and county interests who receive the slag free and truck it away for various purposes.

Make Yearly Estimate

Tentative estimates are made in August of each year for the tonnage of raw materials required in the foundry for the following year. These estimates are based on the past years production and on all the available sources of information from which a forecast of the coming year's requirements may be predicated. As a result of many years experience the estimates usually are surprisingly accurate.

Fuel oil and core oil are delivered in tank cars by rail and therefore are not subject to the climatic restrictions which govern the delivery of iron, coke, limestone and sand. Fuel oil used principally in the coreovens is stored in large underground tanks. Core oil is stored in two 10,000 gallon tanks in a building separated by a driveway from the south side of the foundry building.

A two-story building in line with the core oil building is fitted up for a variety of purposes. The greater part of the upper story is devoted to patternmaking activities. It is fully equipped for wood and metal working and furnishes employment for 200 to 400 patternmakers working in three shifts. In addition to new patterns, and other pieces of equipment needed in the foundry, constant replacement of existing patterns has to be effected. Under intensive production methods it is claimed that the life of a metal pattern rarely exceeds a year. Abrasive action of the sand rapidly removes the few thousandths of an inch tolerance beyond which the pattern is useless.

Part of the upper story of this building is occupied by a physical and chemical laboratory equipped with the usual apparatus for pursuing investigation into the characteristics of raw materials and finished product. Constant routine check is kept on the analysis and physical properties of castings made from standard and special iron mixtures. Production in this foundry is limited to complete sets of gray iron castings for automobiles and includes 82 separate items.

Greater part of the lower story is a maintenance department fitted up with wood and metal working machines for the repair of broken or crippled parts of the elaborate mechanical equipment through which the foundry functions. One end of the maintenance building is occupied by a store room containing replacement parts and miscellaneous foundry supplies. The other end is equipped with a number of machines for cutting and forming wires for the core department.

Part of the plant office building is fully equipped as a first aid and emergency hospital with nurses and a doctor in attendance. Notices throughout the plant direct attention to the importance of safety first and the necessity of reporting all accidents immediately. Extensive wash and shower rooms are provided in addition to lockers where employes keep changes of clothing.

A cafeteria with a seating capacity of 1800 is maintained on the premises for the benefit and convenience of employes, who may bring or buy their lunches. Food is served at a nominal price and employes are required to use this room so that they have a clean, comfortable place to eat. Its use simplifies the collection of discarded papers, bags, boxes and other containers after the meal.

The plant operates on three 8-hour shifts, but since a half hour is taken out for lunch on each shift the men work only 7½ hours per day. The first group goes on at 7 a.m. the second at 3 p.m. and the third at 11 p.m. Men of the relieving shift are present and ready to take their stations before the men on the preceding shift depart. In this manner production is not interrupted. Blast is shut off half the cupolas, conveyors are stopped and all activities cease in one half the foundry during the lunch period. When the first group has returned to the job, the remainder of the force goes to the cafeteria.

This is the first of four articles dealing with the Chevrolet Motor Co.'s foundry at Saginaw, Mich. The second of the series will appear in an early issue of THE FOUNDRY.

THE EDITORS

Exempted from Provisions of Code

Thirteen members of the cast iron pressure pipe industry have been exempted from the wage and hour provisions of the code of fair competition of the gray iron industry, according to a recent announcement of the National Recovery administration. The request for exemption came from the code authority of the cast iron pressure pipe industry.

It was shown that the complaining manufacturers do occasionally make castings covered by the gray iron foundry code, but that these castings aggregate only 65/100 of 1 per cent of their total production.

Associated Industries of Cleveland recently has made arrangements to conduct night classes in both foundry and patternmaking.

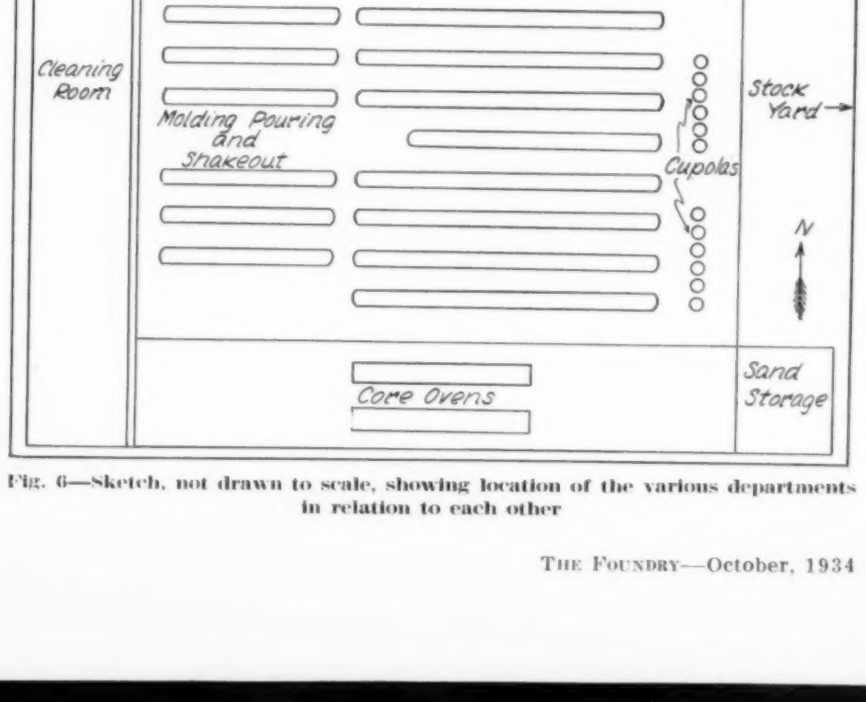


Fig. 6—Sketch, not drawn to scale, showing location of the various departments in relation to each other

ADVERTISING PAGES REMOVED

Gray Iron Foundry Cost System

(*Continued from page 45*)

6. Be prepared to prove what the actual cost was on any job.

II. Recommended Optional Procedure:

1. To figure an actual cost on every job in the shop so that the actual cost on any job can be verified easily in case of complaint.
2. To make up monthly cost reports, or monthly profit and loss statements.

Normal Volume and Normal Costs

General overhead expense is an important element of cost, and the greater part of general overhead expense, including such items as the fixed charges (taxes, insurance and depreciation). Administrative expense and selling expense remain fairly constant whether the foundry is operating at normal volume or at only 25 or 50 per cent of normal. It is a recognized principle of sound cost accounting that the entire fixed or nonvariable general overhead should be charged into cost only when operating at normal volume. When operating at 50 per cent of normal, only 50 per cent of nonvariable general overhead is charged into cost.

Normal volume generally is defined as a certain percentage of capacity, or of maximum volume which has ever been attained. In order that all members of the industry shall handle this item of cost in the same manner, the method of determining capacity and the percentage of capacity which shall be taken as normal should be the same for all members of the industry.

The average rate of operation of industry as a whole during the 8-year period 1924-31 generally is considered to represent a normal rate of operation. During this period it is estimated that the gray iron foundry industry was operating at approximately 65 per cent of its maximum average operations during its best six consecutive months since Jan. 1, 1924. This percentage has been approved by the code authority for the present, but may be modified later when more accurate industry statistics become available.

Simplified Cost and Estimating Procedure

I. Cost Divisions of the Foundry:

Manufacturing Departments—In the simplified procedure foundry manufacturing operations are divided into four cost divisions, or manufacturing departments, defined as follows:

1. Melting department begins with unloading and storage of iron and fuel, and ends with delivery of molten metal at the spout of the cupola or furnace.

2. Molding department begins with transportation of molten metal from spout, preparation of molding sand, and transportation of molding sand, patterns, flasks, or other molding equipment or supplies from storage, and ends with delivery of castings to cleaning department.

3. Core department begins with preparation of core sand and transportation of core sand, core boxes, etc., from storage and ends with delivery of finished cores to molding department.

4. Cleaning and shipping department begins when castings are received from molding department (but includes any cleaning labor performed in the molding department) and ends when finished castings have been delivered to shipping platform. Includes shipping clerk and helpers, but not truck drivers or other delivery expense.

General overhead expense includes all items of cost which cannot be allocated directly to one of the manufacturing departments (or auxiliary departments). Normal general overhead is distributed completely to the manufacturing or auxiliary departments by the methods outlined in this cost system and thus becomes a part of departmental costs and overhead expenses.

II. Classification of Cost Accounts:

The following minimum number of cost divisions and cost accounts shall be kept:

1. *Melting Department*
   - 10. Pig iron, purchased scrap, and alloys
   - 12. All labor
   - 13. All other expenses
   - 19. Share of general overhead
2. *Molding Department*
   - 21. Molding direct labor
   - 22. All indirect labor
   - 23. All other expenses
   - 29. Share of general overhead
3. *Core Department*
   - 31. Coremaking direct labor
   - 32. All indirect labor

Table I

Cost Estimate Sheet or Card

Customer			Date	Est. Actual
Patt. No. and Description		Class	Quan.	
Patt. Equip.		Flask	Mltd. Metal	
Wt. p. pc.	Pcs. p. Mold	Wt. p. Mold	Mold Dir.	
Cores p. pc.			Mold Ovhd.	
Molders Rate		Coremakers Rate	Core Dir.	
Helpers Rate		Helpers Rate	Core Ovhd.	
Total Rate		Total Rate	Cl. and Ship.	
Date	Est.	Actual	Total	
Mixture			Loss %	
MOLD	Piece Rate or Molds per Day or Hours per Mold		Cost f.o.b. Foundry	
CORE	Piece Rate or Sets per Hour or Hours per Set		Del'y Cost	
			Del'y Cost	
			Cost per lb.	
			Extra Wk.	
			Total Cost	
			Profit	
			Price	

Note: *Class* refers to molding subdivision: heavy floor, jolt, squeezer, etc. *Pattern Equipment* refers to plate, gate, wood patterns, etc. *Flask* means flask size. *Molders Rate* is rate of molder on the job per day or hour. *Mixture* refers to mixture No. 1, 2, or 3, etc. The various mixtures in use should be given numbers and the cost per pound of each should be figured. *Extra Work* refers to cost of any special pattern or flask equipment for the job, or cost of any subsequent processing.

Foundries can vary the above form to suit their own individual requirements, as long as the basic cost data and formula for figuring cost is the same as in the above form. Foundries using one of the standard methods for cleaning and shipping cost can easily make up a form appropriate for these methods.

33. All other expenses
39. Share of general overhead

4. *Cleaning and Shipping Department*
42. All labor
43. All other expenses
49 Share of general overhead

10. *Variable General Overhead* (included at actual cost)
100. Power, light and heat
101. Workmen's compensation insurance
102. Variable general labor and expense

11. *Nonvariable General Overhead* (normalized)
110. Taxes, insurance, and depreciation of buildings
111. Depreciation of equipment
112. All other nonvariable general labor and expense, (including nonvariable plant general, general supervision, administrative and selling expense)

III. Determination of Normal General Overhead:

Your production in tons for your best 6 consecutive months since Jan. 1, 1924, multiplied by two, is to be taken as your yearly *capacity*. Not over 65 per cent of this yearly *capacity* is to be taken as *normal* yearly production for your plant. Normal general overhead for any period is obtained as follows:

Nonvariable general overhead (Accounts 110, 111, and 112).

Multiply the total of each account for the period by the percentage ratio which your production for the period bears to your *normal* production for the same length of time. The result is the *normalized* value of each account, which is to be charged into cost.

Variable general overhead (Accounts 100, 101 and 102). These accounts are charged into cost at actual value.

Exception—where normal capacity, as determined by the standard method, is clearly inequitable in any individual case on account of special circumstances, or where the foundry was not operating during all of the period since Jan. 1, 1924, a different method of determining normal capacity may be approved upon submission of proof to the code authority.

(Note: Costs figured in accordance with this procedure are minimum costs below which members of the industry are not allowed to sell. Any member of the industry may, however, if he so desires, charge into his cost his entire actual general overhead, or a greater percentage of his actual general overhead than would be charged into cost by the above procedure.)

IV. Allocation of Normal General Overhead to Departments:

Power, light and heat (Account 100) is allocated on the basis of the metered or estimated consumption of each department. Taxes, insurance and depreciation of buildings (Account 110) is allocated on the basis of floor space in each department. Depreciation of equipment (Account 111) is allocated on the basis of the value of the equipment in each department. The balance of general overhead (Accounts 101, 102, and 112) is allocated on the basis of the total payroll of each department. Each department's proper share of general overhead is charged into Accounts 19, 29, 39 and 49. Normal general overhead therefore is distributed completely, and becomes a part of departmental costs and overhead expenses. At the discretion of the individual members, man hours or machine hours may be used.

Note: This standard method is recommended for all members, but small foundries, who find it impossible to use the standard method, will be permitted to allocate their entire normal general overhead (Accounts 100, 101, 102, 110, 111 and 112) to the four production departments in proportion to the total payroll dollars (direct plus indirect) in each department.

V. Determination of Departmental Costs and Overhead Rates:

Departmental costs and overhead rates are determined from the cost records for the preceding period of a year or at least 6 months as follows:

1. *Melting Department*

Cost of Metal per pound of good castings produced, for any particular mixture, is determined by dividing the net cost of the metal consumed (cost of charge less value of average returns at scrap value) by net good castings produced (weight of a charge multiplied by average percentage of good casting yield). Average percentage of good casting yield is determined by dividing total good castings produced over a period of at least 3 months by total metal charged during the period. Average returns may be taken as weight of charge minus average good casting yield per charge. In figuring the cost of the charge, pig iron, purchased scrap, and alloys are valued at cost or market whichever is lower, plus freight and cartage, and returns are valued at scrap value. When alloys are added in the ladle, the cost of metal is determined by adding to the cost of the charge the value of the amount of alloys which would be required in the charge to give the desired analysis.

In event of a violation of the code, if the respondent can establish that current market prices of metal are less than his actual cost of same, that fact shall be taken into consideration.

Cost of Melting per pound of good castings produced is determined by dividing total cost of melting (Accounts 12, 13 and 19) by total pounds of good castings produced.

Cost of Melted Metal per pound of good castings produced is the sum of cost of metal plus cost of melting. This is applied to individual jobs on a pound basis.

2. *Molding Department*

Molding Direct Labor is handled as a direct cost item, and is applied to individual jobs by determining the actual direct molding time and cost on each job.

Molding Overhead Percentage — Total molding department overhead (Accounts 22, 23 and 29) divided by the total molding direct labor (Account 21) gives molding overhead percentage. This is applied to individual jobs as a percentage on direct molding labor cost.

3. *Core Department*

Coremaking Direct Labor is handled as a direct cost item, and is applied to individual jobs by determining the actual direct coremaking time and/or cost on each job.

Core Overhead Percentage — Total core department overhead (Accounts 32, 33 and 39) divided by total coremaking direct labor (Account 31) gives core overhead percentage. This is applied to individual jobs as a percentage on direct coremaking labor cost.

4. *Cleaning and Shipping Department*

Method I—Tonnage Basis

Total cleaning and shipping cost (Accounts 42, 43 and 49) divided by total pounds of good castings produced gives cost of cleaning and shipping per pound of good castings produced. This is applied to individual jobs on a pound basis.

Method II—Molding Labor Basis

Total cleaning and shipping cost (Accounts 42, 43, and 49) divided by total molding direct labor (Account 21) gives cleaning and shipping cost in percentage of molding direct labor cost. This is applied to individual jobs as a percentage on direct molding labor cost.

Note: The standard methods outlined in the standard procedure are the only methods which will give really accurate cleaning and shipping costs and are the only methods recommended. The two simple methods shown will give only approximate accuracy, but are sanctioned for small foundries who are unwilling to incur the slight additional clerical expense involved in the standard methods. Method I is preferred because it is very similar to standard method III, and foundries using method I can very easily subdivide their cleaning and shipping departments and change over to standard method III.

VI. Example of Job Costs (Using method I for cleaning and shipping cost)

Let us assume that the departmental costs and overhead rates of a certain shop have been determined from the shop cost records to be as follows:

Cost of melting per pound of good castings produced 0.7c
Cleaning and shipping cost per pound of good castings produced..... 0.8c
Molding overhead percentage..... .....140 per cent
Core overhead percentage 160 per cent

Note: It should be understood clearly that these figures have been assumed arbitrarily for purposes of illustration only. Your costs may be quite different.

On the job whose cost is to be figured, the following cost data has been obtained: Weight per piece — 50 pounds; pieces per mold—2; weight per mold—100 pounds; molding production—6 molds (600 pounds) per 8-hour day, including pouring, $6; molder; cores per piece—2; core production—3 sets per hour (150 pounds) $6; coremaker (75 cents per hour); Loss 10 per cent; cost of metal for

(*Concluded on page* 102)

MODERN
Covered and Insulated Ladles—

will keep your metal hotter; enable you to use larger ladles; to pour by machinery light work which could not be poured so formerly; to save the "drop" in the ladles which formerly had to be "pigged"; to protect your men from the heat and gases of the ladle and thus make for better labor conditions.

Tests in a malleable foundry showed conclusively that the metal could be held almost three times as long in a covered, insulated ladle as in an open ladle, with a corresponding drop in temperature. The malleable foundry whose installation is shown here, stepped up from a 500 pound open to a 1200 pound covered ladle.

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CAST IRON
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SPECIAL ALLOYS

THE MALUMINUM COMPANY TRANSPORTATION BUILDING NO. 263 INDIANAPOLIS, IND.

(*Concluded from page* 100)

mixture used—0.9 cents per pound; cost of delivery—0.1 cents per pound.

From this data the cost of the job is figured as follows:

	Cost of Days Work Dollars	Cost Per Pound Cents
Melted metal @ 1.6c per lb. (0.7 plus 0.9)	9.60	1.6
Molding direct labor	6.00	1.0
Molding overhead (140%)	8.40	1.4
Core direct labor	3.00	0.5
Core overhead (160%)	4.80	0.8
Cleaning and shipping cost @ 0.8c per lb	4.80	0.8
Cost without loss	36.60	6.1
Add 10% for loss	3.66	0.61
Total cost f.o.b. foundry	40.26	6.71
Add cost of delivery	0.60	0.1
Total cost delivered	40.86	6.81

VII. Members are expected to select one of the alternative methods sanctioned in this uniform cost and estimating system, and to use this method continuously unless the code authority is notified.

This is the first of two installments giving the new uniform cost and estimating system of the gray iron foundry industry. The second and concluding installment will be presented in an early issue.

THE EDITORS

Nonferrous Group Discusses Costs

(*Concluded from page* 70)

codes was the principal speaker. He compared the depression to an epidemic of foundry losses, its reasons to the various alibis and its cure to unknown factors, just as in self corrected casting difficulties. Mr. Janssen deprecates reckless criticism of the President's recovery program. He stated that shorter work weeks can come only when improving business shows industry has the power to absorb the costs. The omission of the liquidated damages provision in all except the steel code is a weakness in administration, according to the speaker. Such a provision makes the industry judge of infractions and gives power for correction and prompt punishment.

Various officers reported at the dinner session and an election resulted in choosing again as president and vice president, respectively, N. K. B. Patch, Lumen Bearing Co., Buffalo and Allen B. Norton, Aluminum Company of America, Cleveland. Meeting of the administration agencies, the code authority and directors of the Nonferrous Foundry association closed the convention Friday. Sam Tour, Lucius Pitkin Co., New York was elected executive secretary and treasurer.

Quad City Discusses Affiliation with A. F. A.

Seventy-five members attended the first regular meeting of the 1934-35 season of the Quad-City Foundrymen's association, which was held at the Hotel Blackhawk, Davenport, Iowa, Sept. 17. Clyde Burgston, Deere & Co., Moline Ill., president of the association, presided and outlined the work for the coming year. The October meeting will consider the subject of "Pig Iron" and in November a joint meeting will be held with the Tri-City chapter of the American Society of Metals with a paper "Heat Treatment of Cast Iron" by J. S. Vanick, International Nickel Co., New York.

Hyman Bornstein, Deere & Co., director of both the Quad-City group and the A. F. A. gave a brief report on the proposed plan to organize a Tri-City chapter of the American Foundrymen's association. He pointed to the benefits which both the local and the national organizations would receive from such affiliation and stated that information on the subject will be sent to all members with the notice of the October meeting.

Fred J. Walls, Eaton-Erb Foundry Co., Vassar, Mich., was the principal speaker of the evening, discussing "Recent Developments in Gray Iron Casting." Mr. Walls spoke on the use of permanent molds and outlined the reasons for the application of that type of equipment. The speaker mentioned a number of recent developments in the production of castings, such as the manufacture of cast crank shafts, valve inserts, sleeve-liners and heat-corrosion resisting metals. Much research work now is in progress and many more changes will be revealed in the future.

The next meeting will be held at Moline, Ill., on Oct. 15.

To Continue Study Of Temperature Effect

The joint research committee of the American Society for Testing Materials and the American Society of Mechanical Engineers on effect of temperature on the properties of metals, at a recent meeting, voted to draw up a definite plan, for submission to letter ballot, for experimental study of methods of evaluating the load-carrying ability of metals under prolonged stress at high temperatures. The *creep* of selected materials will be studied by test runs to be carried out, not merely for 1000 or 2000 hours, but for 3 years, or say 25,000 hours, so that the validity of various methods of approximation and extrapolation and the relation of various *short-cut* methods to actual long-time performance may be evaluated.

It also voted to study experimentally the progressive changes in toughness, during long exposure to high temperatures, of the 18-8 stainless steel whose creep properties have already been studied in detail by the committee.

Still another activity is a correlation of data on seizure, i. e., the effect of temperature on metal-to-metal wear, galling and sticking. Users and makers of valves that operate at elevated temperatures find this an important problem in which available information is chiefly of an empirical nature. It is hoped to aid in the transition from empiricism toward a more sound basis for engineering design and selection of materials.

British Institute Holds Meeting in Belgium

General meeting of the British Iron and Steel Institute was held at the Palais des Academies in Brussels, Belgium, Sept. 10 and 11. During the meeting it was announced by the president, W. R. Lysaght, chairman and managing director of John Lysaght, Ltd. that His Majesty the King of the Belgians (Leopold III) had honored the institute by accepting nomination as honorary member. This continues the tradition by which H. M. King Leopold II (1874-1909) and H. M. King Albert I (1913-1934) had been honorary members of the institute.

Leon Greiner, director and general manager of Societe Anonyme John Cockerill, Liege, and Aloyse Meyer, general manager of ARBED, Luxemburg, have been nominated honorary vice-presidents of the Institute. These gentlemen acted as presidents of the reception committee formed in Belgium and Luxemburg to arrange for the entertainment of the members of the Institute visiting those countries.

It was announced that the council was proposing Sir Harold Carpenter for election as president at the annaul meeting of the Institute in May, 1935, and that they had elected James Henderson, deputy chairman and general manager of the Appleby Iron Co., Ltd., and of the Frodingham Iron & Steel Co., Ltd., and president of the British Iron & Steel Federation, to be honorary treasurer of the Institute in succession to Sir Harold Carpenter, who is resigning at the end of September.

The date of the annual meeting, 1935, was fixed at Wednesday to Friday, May 1 to 3, and the annual dinner for May 2.

Employes of the Moline Iron Works, Moline, Ill., recently held a picnic on Campbell's island, with 2000 present. L. E. Nutt is president of that company.

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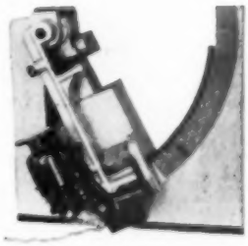
In this new casting era too much stress cannot be laid on the QUALITY of your castings. Accurate SAND CONTROL will do more than any other single factor to insure quality castings time after time.

Write to us—Sand Control Equipment—Sand Research—Sand Problems



Universal Sand Strength Machine Type C. P.

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Use Plaster for Foundry Patterns

(*Concluded from page* 48)

be used repeatedly the plaster or wax must be cast through a gate which will not interfere with further functioning of the mold. For that reason a gate corresponding in a general way with that shown at *A* is provided either at one end or at one side in the drag section of the mold. The two plaster parts are clamped together and turned up on end or on the side. The liquid plaster or wax is poured while the mold is thus in a vertical position. In many instances, particularly where the resulting object is decidedly thin, the vertical position of the mold is advantageous since gravity assists in the distribution of the liquid material.

Patterns for the foundry use may be cast from several proprietary materials sold in the form of powder. In one a special liquid is employed and is essential to the process. In a second the powder is mixed with water to the consistency of thick cream and poured into a sand mold, or for that matter into a mold made from any other substance. Sand is mentioned specifically, since that is the most readily available material in the foundry. Either of the foregoing materials becomes strong and rigid upon solidification and may be used on the bench or molding machine.

Plaster of paris patterns are not as strong as the patterns made from the proprietary materials, but they serve for a limited time where they are not subjected to severe strains, jars or shocks. The material is a pure white powder ground exceedingly fine which has the peculiar property of setting in a hard mass after it has been mixed with water. The amount of water added to a given amount of plaster affects the setting time and the subsequent strength of the object. However, these properties do not vary to any adverse extent in mixtures ranging between plaster 70, water 30 per cent, and plaster 50, water 50 per cent.

The actual degree of liquidity—if there is such a word—depends on the method or the specific location where the plaster is to be applied. Mixed with water to the consistency of cream, claywash or blacking designed for a large mold, it will flow readily into thin intricate shapes. It is mixed to a little thicker consistency when it is to be manipulated by sweeps or strickles. On large, rough areas, foundations, interior walls and other places requiring large amounts of material, the plaster is mixed to the thickness of loam and daubed or thrown on by hand after the manner employed by a loam molder. This thick material will crack and warp to some extent, but these are not factors of any importance in the rough walls.

Normally 50-50 mixture of plaster and water will set in 20 to 30 minutes. Therefore in some instances it becomes necessary to add another ingredient to the mixture to allow the operator time to complete the work. Various substances used for this purpose include clay water, lime water, glue water, dilute vinegar, gum arabic, mucilage, grape fruit juice.

Conversely, acceleration of the setting time is secured by the addition of hot water, salt, alum or water glass (sodium silicate). Manifestly expert manipulation of these mixtures only may be acquired through extended actual experiment.

In preparing a plaster of paris mixture the operator calculates the approximate amount required. He measures an equal amount of water into any convenient vessel—usually a pail—and then adds the plaster either by sifting it through a fine sieve or in a single stream through the fingers. The mixture is stirred with a piece of wood or by the hand to break up any lumps and to insure a uniform consistency. Plaster remaining in the pail after the mold has been poured is of no further use unless it can be applied elsewhere immediately. Unless it is dumped it will solidify and cling firmly to the bottom of the pail.

This is the second in a series of five articles on the use of plaster as a pattern material in the foundry. The third will appear in an early issue

THE EDITORS

Presents Budget For Nonferrous Industry

Total amount of the budget recently presented by the code authority of the nonferrous foundry industry is $104,626.40. The basis of contribution would be 0.3 of 1 per cent of gross sales of products of the industry as defined by the code, for the period of the budget, payable monthly on the previous month's sales.

Speaks on Costs

J. L. Carter, Gray Iron Founders' society, addressed the members of the New England Foundrymen's association on Wednesday, Sept. 19, at a meeting held in the Engineers club, Boston. Mr. Carter spoke on "The Organization of District Chapters and the Administration of Cost Provisions of the Gray Iron Foundry Code."

Cast From "The Old Oaken Bucket"

By Robert C. Hopkins, Alliance, O.

How dear to my heart is Dan Avey's Foundry,
As monthly the postman presents it to view;
The cover, the make-up from type font to boundary,
And every loved shekel for subscript we blew;
The wide spreading ad, the cut that stands by it;
The Editor's section and staff writer's page;
The news of the art under Dan's careful edit,
And e'en Patrick Dwyer, alive to the age;
The pen loving Patrick, the versatile Patrick,
Writes mirth and good humor while others may rage.

This keen, gifted writer we hail as a treasure;
For often dull moments obscure the New Deal,
We find him the source of exquisite pleasure,
As he grinds out his copy like grain into meal.
How ardent and steadfast, yet never horn blowing,
Each monthly adventure goes into the mold.
He writes of an art where there's hot metal flowing,
And steers clear of vending the chestnuts of old;
The Eocene chestnut, the Cretaceous chestnut,
The Jurassic chestnut, no longer extolled.

How neatly we plan, our friends, to retain them,
To know and enjoy their work and their play;
Not a full foaming beaker could make us forget them,
Though life's complete journey adds many a day.
And now we look forward to business that's better,
When political quacks shall not cripple desire;
So here's a good wish for Dan Avey's go-getter,
He's Pat of THE FOUNDRY, whose name ends with Dwyer;
The good artful molder and likewise an author,
A servant of rating well worthy of hire.

Modestly deprecating all, except the glowing appraisal of the work and worth of Pat, for more than 15 years active on the staff of THE FOUNDRY, we thank and publish Bob Hopkins' poem.—THE EDITORS.

ADVERTISING PAGES REMOVED

Short Cycle Anneal for Malleable

(*Concluded from page* 51)

the oven as well as in the pots. (It was found necessary to leave out four curves from the chart shown in Fig 3 and the temperatures given represent the readings of only one front pot couple, one rear pot couple, one side couple and the roof couple.) A study of the chart shows a considerable lag between the exposed and the pot couples. After firing for 12 hours we find a lag of 875 degrees between the exposed side and the front pot couples, and 1195 degrees between the same exposed and the rear pot couples, giving the front pots a lead over the rear pots of 350 degrees.

Show Temperature Variations

The couple inserted through the roof registered 1930 degrees or 170 degrees higher than the exposed side couples, 1045 degrees higher than the front pot couples and 1370 degrees higher than the rear pot couples.

After 12 more hours of firing the exposed and the pot couples have moved closer together. The lag between the exposed and the front pots has been cut from 875 to 140 degrees, and between the exposed and the rear pots from 1195 to 380 degrees. The temperature in the front pots is now 1740 degrees and in the rear pots 1500; a difference of 240 degrees.

Firing stopped after 2 hours with a difference in temperature between the front and the rear pots of 205 degrees. The oven was sealed and held. It took 8 hours for the temperature in the pots to be brought within 30 degrees, or 1760 for the front and 1730 for the rear pots. For the next 12 hours the temperature changed but little, the range narrowing down to 20 degrees. The first-stage graphitization then was considered completed and the temperature allowed to drop rapidly. A gentle flow of air was blown into the oven to accelerate the circulation and subsequent cooling. In one hour the temperature outside of the pots dropped from 1800 to 1480 degrees but it took the front pots 10 hours and the rear pots 13 hours to drop to that temperature.

In 13 hours the exposed couples were down to 910 degrees. Dampers again were closed and sealed to check the drop in temperature. This, however, was too late as shown in Fig. 3. The temperature kept on falling although fire was started 3 hours after dampers were closed. Considerable time was lost because of failure first to check the temperature going up; second, to check the drop in temperature on cooling to 1400 degrees. Referring to Fig. 1 the temperature should have been checked at *A* fire stopped and couples equalized. Because of failure to start fire in time the temperature in the pots dropped to 1210 degrees in the rear and 1065 degrees in the front. This necessitated firing for 9 hours to bring the temperature to within the critical range, 1290-1380 degrees. This temperature was maintained for 22 hours.

Shows Operating Method

This account of the workings of an annealing oven which is not in accordance with desired practice, is presented with the idea of showing how not to operate the oven. Plotting the temperature, as was done in this case, Fig. 3, will reveal the cause of the irregular and undesirable fluctuations in temperature. By a close study of this graph more will be learned than by referring to a graph representing an ideal operating condition. For best result, the firing diagram in Fig. 1 should be adhered to as closely as possible.

In the case under consideration the line *FP2* represents the temperature in the front pots and *RP6* the temperature in the rear pots. It will be noted that after 18 hours of firing the temperature has risen to 1500 degrees in the front pots whereas the rear pots register only 1080 degrees. The exposed side couples show 1870 degrees. At this point the fire should have stopped and dampers closed to give the temperature a chance to soak through. After the four corner pots have been brought together, firing should again start.

Referring to Fig. 1 the solid line represents the ideal condition; a steady rise in temperature throughout the oven. The dotted line up to *A* represents the case under discussion and the broken line indicates a lesser difference between the pot couples.

It is not possible to lay down rules to be followed without regard to local conditions. The chart in Fig. 3 showed the condition in the oven and with this knowledge it was only a matter of close observation to bring about the best in annealing practice.

Book Review

Recommended Methods for Testing and Control of Foundry Molding Sands, 54 pages, 6 x 9¾ inches; paper cover, published by the British Cast Iron Research association and supplied by THE FOUNDRY, Cleveland.

In 1930 the British Cast Iron Research association issued, as research report No. 73, full details of the methods of testing foundry molding sands for both research and foundry control purposes, which had been adopted in the work done by the Association over a period of 5 years. In view of the general interest in this subject, the council made the report available to all interested and it rapidly went out of print.

The present report, special publication No. 2, forms the second edition of this report, and is revised and enlarged. It deals with recommended methods for the testing and control of foundry molding sands for any branch of foundry work. The bulk of the report consists in the procedure recommended for sampling, milling and ramming of molding sands and recommended methods for determining moisture, particle size, the mechanical strength, permeability and refractoriness of molding sands. A section is included on chemical analysis and appendices are included on the principles governing the size of the recommended text pieces and representative results from all parts of Great Britain in various branches of foundry practice. A complete statement of recommended testing apparatus, with prices, also is included.

Approves Code for Manganese Steel Castings

National Recovery administration recently announced an order approving the code of fair competition for the steel casting industry as the code for the manganese steel casting industry. The order defines "manganese steel castings" to mean that group of steel castings known in the trade under that name and having a manganese content of not less than 10 per cent.

The order further provides that the continued participation of the Manganese Steel Founders' society in the code authority after 30 days from Sept. 24 would be contingent upon the amending of the constitution and by-laws to the satisfaction of the administrator.

Connecticut Group Meets

Connecticut Nonferrous Foundrymen's association held its first meeting of the fall season at the New Haven Yacht club, New Haven, Conn., Sept. 11. The meeting was devoted to a round table discussion of various foundry problems, led by David Tamor, Reading, Pratt & Cady Co., Hartford, Conn., and president of the association, who covered alloys of electrical conductivity and the treatment of ladles and crucibles used for pouring purposes.

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for *perfect* match of surface

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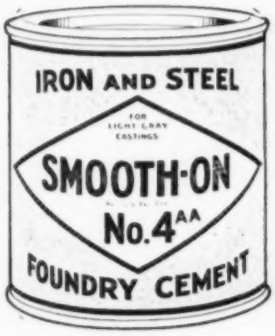

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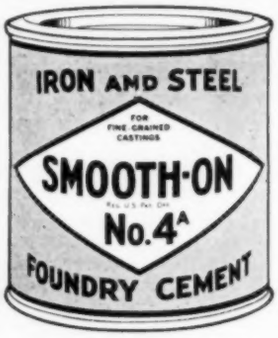

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For medium gray castings. A fine grained cement that has a good metallic lustre.

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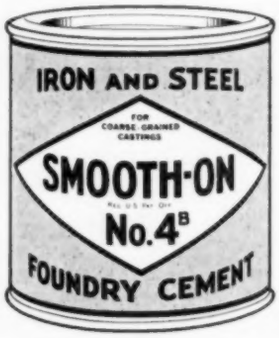
This achievement makes the surface corrections undetectable, and adds significant efficiency to Smooth-On treatment.



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For dark gray castings. A cement of coarser grain and darker shade.

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10-34

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There are five other reasons for your looking into this barrel further. May we send them to you in a letter?

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New IDEAL Side-Loading Star Return Barrel.

Oiled Air is better than a poor memory for Air Tools!

Ever forget to oil your pneumatic tools? Do your operators ever forget? Air tools suffer from lack of oil or when improperly, haphazardly lubricated. A Norgren Sight Feed Automatic Air Line Lubricator feeds oil to the tool *with the air that drives it.* All the time the tool is in service it is being lubricated, *automatically, continuously.*

It's adjustable, from zero to a constant saturation of the air stream. It guarantees smooth, efficient operation and *there's no other device that will do this job.* Once installed, no Norgren Lubricator has ever been taken off, because it saves far more than it costs. We ship it on trial to any responsible inquirer—if it doesn't make good on your equipment, it's no sale.

Write for specifications and prices.

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Obituary

HARRY D. HARTLEY, 64, president and founder of the Eagle Coal & Foundry Co., Muncie, Ind., died at his home recently. With J. Ross Crozier, Mr. Hartley started the foundry in Muncie in 1901, and later bought out the interest of his partner. He also was one of the founders of the Indiana Foundry Corp., Muncie, in 1921.

♦ ♦ ♦

David Findlay Sr., 74, president of Findlay's Ltd., stove manufacturer, Carleton Place, Ont., died recently.

♦ ♦ ♦

Frank B. Reed, 82, formerly head of the Clearfield Machine Co., Clearfield, Pa., died recently.

♦ ♦ ♦

Arthur A. Fowler, 56, at one time president of the Rogers, Brown & Co., a director of a number of companies including the Stonega Coke & Coal Co., and retired since 1928, died at his summer home in Hamilton county, New York, Sept. 2.

♦ ♦ ♦

Alexander P. Gow, 61, president, Scott Valve Mfg. Co., Detroit, died recently. Mr. Gow was a native of Guelph, Ont., but had lived in Detroit for many years. He was employed by the old Scott Valve Co. for several years and became president of the new company when it was organized 5 years ago.

♦ ♦ ♦

Joseph Betts Smith, for the past 26 years plant engineer of the Malleable Iron Fittings Co., Branford, Conn., died Aug. 21, after an illness of several weeks. Mr. Smith was born Sept. 4, 1868 at New Haven, Conn., was educated at the Hillhouse high school, New Haven and at the sheffield Scientific school, Yale University. His professional career began with the Thompson-Houston Co., Lynn, Mass., and later he was connected with the River Point division of the Providence Railway system and the Central Power Co., Mystic, Conn. For a number of years he was a member of the board of education and served a term as Burgess of the Borough of Branford.

♦ ♦ ♦

P. C. Leonard, district sales manager, at Chicago for General Refractories Co., died recently. He had been connected with that company since 1923 and previous to that was identified with the American Refractories Co.

♦ ♦ ♦

John Percival Jefferson, 82, former president of Struthers, Wells & Co., Warren, Pa., died Sept. 2 at Santa Barbara, Calif. Mr. Jefferson was born in New Castle county, Del., on March 11, 1852. He was graduated from West Point military academy in 1875 and later from U. S. Artillery school at Fortress Monroe. Later he took charge of the military department of Brooks school at Cleveland. Resigning from the army, he became a member of the firm of Struthers, Wells & Co., serving as managing partner until 1886 when he was elected president. He resigned in 1902 but retained his interests in several lines of business.

White Brass Contains Considerable Tin

The terms white bronze and white brass sometimes are used synonymously. White brass usually contains considerable tin, and is used for marine bearings and whenever a tough bearing metal is required. Parson's white brass is a good example, and it contains 65 per cent tin; 30 per cent zinc; 2½ per cent antimony, and 2½ per cent copper. A cheaper white brass contains 24 per cent tin; 76 per cent zinc, and 4 per cent copper. The term white bronze sometimes is applied to zinc without any alloying metals.

Zinc alloyed with copper and aluminum also is called white bronze, and a good alloy of that type contains 85 per cent zinc; 10 per cent copper and 5 per cent aluminum. It is a good bearing alloy and has been used for liners of water works engines with success. It is a sand casting alloy and shrinks considerably. Consequently, heavy risers should be used. That alloy is not suitable for casting in chills as it will grow. A zinc-base alloy that has met with much favor for pressure die casting contains 92.9 per cent high grade zinc; 4 per cent aluminum; 3 per cent copper, and 0.10 per cent magnesium.

Check Idle Belts When Returned to Service

Information on putting belts back into service, particularly of interest to those starting production on machines shut down for some time, has been issued by the E. F. Houghton Co., Philadelphia. Belts soaked with mineral oil should be de-greased by soaking in gasoline or carbon tetrachloride for 24 hours or longer. Natural oil in the leather as well as the mineral oil is removed by de-greasing making it necessary to restore the belt by applying a good belt lubricant.

All laps, especially the tips should be checked to see that they have not started to separate. If it be found necessary to re-cement a lap, all the old cement should be scraped off. The lap should be roughened up with coarse emery cloth or wire brush before cement is applied. Foreign matter such as lumps of belt dressing, dirt, wood chips or adhesive material of any kind should not be permitted to gather on the belting or pulley faces. The belt should be cleaned by scraping with a dull-edged scraper with rounded corners.

A belt left under tension on an idle drive is, no doubt, stretched and should be removed and shortened to restore proper tension. Pulley alignment should be checked. Fasteners of all types should be gone over and worn or broken ones replaced. A worn fastener is liable to "let go" at any time. A broken fastener causes the belt to run crooked and will damage the pulley.

Book Review

If You Want To Get Ahead, by Ray W. Sherman, cloth, 186 pages, published by Little, Brown & Co., Boston, and supplied by THE FOUNDRY for $1.50 and in Europe by the Penton Publishing Co., Ltd., London.

This book, one of the best of many inspirational volumes designed to assist the reader in making a greater financial success of his life, contains much of interest for both the employer and the employee. The author has boiled the secret of his formula into one sentence, "Simply do the things you already know you ought to do and stop doing the things you already know you ought not to do." The author points out that the more important of the two is doing rather than not doing. To get ahead, one should do the important things first, or if discipline is needed, the difficult and distasteful things should take preference. The bulk of the book is devoted to amplification of this premise.

The discussion which the author has presented was developed by a process of research extended over a considerable period. The material was collected during an investigation for a business paper of methods that made for success. With a great industry as laboratory, Mr. Sherman has been able to develop an interesting and to many a valuable argument.

A Correction

Through an error, the company connection of J. R. Cooney, winner of a prize at the recent outing of the New England Foundrymen's association, was given incorrectly in the September issue of The Foundry. Mr. Cooney for the past 8 years has been representative of George F. Pettinos, Inc., Philadelphia, and resides at Watertown, Mass.

AN INVITATION

To try all reputable core oils entirely on merits and prove which consistently offers most for your money.

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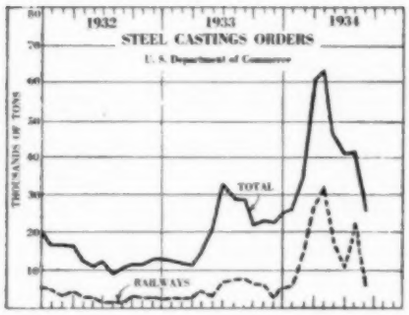
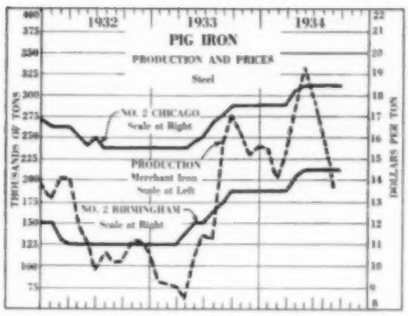
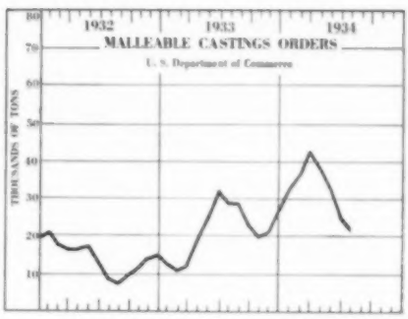






Foundry Activities

Reflect Industrial Trends

FOUNDRY operations in the Philadelphia district during August increased to a marked extent, according to recent reports of the Industrial Research department of the University of Pennsylvania. Tonnage of gray iron castings produced increased 18 per cent, malleable iron castings 37 per cent, and steel castings 13 per cent.

* * *

Fox Furnace Co., Elyria, O., resumed operations Sept. 17, after being shut down for 3 weeks.

* * *

Canada Foundries & Forgings Ltd. is reported having plans made for an addition to its foundry costing $60,000.

* * *

General Pattern Works, Inc., has been formed by Harry C. Bates, R. F. D. 2, Warren, Mich., to operate a pattern shop business.

* * *

Southern Malleable Iron Co., East St. Louis, Ill., resumed operations on Sept. 20, following the settlement of a strike. About 300 men are employed.

* * *

Jeffrey-Quest Foundry Co., 900 South Fourth street, Minneapolis, has awarded a contract for the construction of a 1-story addition to its plant. J. F. Quest is president.

* * *

Sterritt-Thomas Foundry Co., Pittsburgh, has been awarded contract to furnish guard rails for the Montgomery lock walls by the Pittsburgh federal engineers.

* * *

Index for foundry equipment orders in August was 43.1 as compared with 50.7 in July and 56.3 in August, 1933, according to a recent report of the Foundry Equipment Manufacturers' association.

* * *

Summit Foundry Co., Geneva, N. Y., has been reorganized and operations have been resumed. L. F. Millington, Syracuse, N. Y. is general manager for the syndicate which has assumed operation of the plant.

* * *

Bluffton Foundry & Machine Co., Bluffton, Ind., recently organized, has started production on a new automatic stoker designed by Ralph C. Reynolds, Fort Wayne, Ind. The company will continue to manufacture oil field machine parts.

* * *

A petition to effect reorganization of the Fulton Iron Works, St. Louis, under the recently amended bankruptcy law has been filed in federal court. Although not having been adjudicated bankrupt, the company has been operating for the past 3 years under an arrangement with creditors.

* * *

Continental Roll & Steel Foundry Co., East Chicago, Ind., has been awarded a contract for stands for the new 38-inch continuous hot strip four high mill to be installed at Gary by the Illinois Steel Co.

* * *

Favorite Stove & Range Co., Piqua, O., has been sold to a group of Cincinnati men who, it is reported, indicate that they expect to operate the plant as a going concern. The Favorite company has been a leading industry in Piqua for the past 45 years.

* * *

Renown Stove Co., Owosso, Mich., has leased the foundry formerly operated by John Spousta, Owosso, to care for the large volume of orders which has been received. It is planned to add from 25 to 50 molders.

Allegheny Equipment Corp., 1218 Grant building, Pittsburgh, and with warehouse at Bradford, Pa., has been appointed a distributor for shovels, cranes, and draglines by the Link-Belt Co., Chicago. T. F. Ruane will be in charge of sales.

RAW MATERIAL PRICES
Oct. 2, 1934

Iron	
No. 2 foundry, Valley	$18.50
No. 2 Southern, Birmingham	14.50
No. 2 foundry, Chicago	18.50
No. 2 foundry, Buffalo	18.50
Basic, Buffalo	17.50
Basic, Valley	18.00
Malleable, Chicago	18.50
Malleable, Buffalo	19.00
Charcoal iron, furnace	21.00
Coke	
Connellsville beehive premium	$ 5.10 to $ 5.35
Wise county beehive coke	4.30 to 5.30
Detroit by-product coke	8.50
Scrap	
Heavy melting steel, Valley	$10.50
Heavy melting steel, Pitts	10.50 to 11.00
Heavy melting steel, Chicago	8.50 to 9.00
Stove plate, Buffalo	8.00 to 8.50
Stove plate, Chicago	5.50 to 6.00
No. 1 cast, New York	6.25 to 6.50
No. 1 cast, Chicago	8.00 to 8.50
No. 1 cast, Pittsburgh	12.00 to 12.50
No. 1 cast, Philadelphia	11.00 to 11.50
No. 1 cast, Birmingham	8.00 to 8.50
Car wheels, iron, Pittsburgh	10.00 to 10.50
Car wheels, iron, Chicago	9.50 to 10.00
Railroad malleable, Chicago	9.00 to 9.50
Malleable, Buffalo	10.50 to 11.00
Nonferrous Metals	**Cents per pound**
Casting copper, refinery	8.75
Straits tin	50.90
Aluminum, No. 12, producers	18.00 to 22.00
Aluminum, No. 12 (Standard)	14.00
Lead, New York	3.60 to 3.65
Antimony, New York	9.00 to 9.25
Nickel, electro	35.00
Zinc, East St. Louis, Ill.	3.90

New Trade Publications

PNEUMATIC TOOLS — Ingersoll-Rand Co., Phillipsburg, N. J., has published a bulletin on its line of pneumatic tools which includes grinders, drills, riveters, chippers, rammers, wrenches, hoists, etc. Information includes size-and-capacity tables of the various tools. The numerous types available are illustrated.

DIE CASTINGS—Doehler Die Casting Co., Smead and Prospect avenues, Toledo, O., recently has published an interesting booklet entitled "Brass Die Castings With Strength of Steel."

DUST COLLECTORS — Pangborn Corp., Hagerstown, Md., has published a bulletin illustrating its new type of dust collector and pointing to the special features of that equipment.

GLUE POTS—Sta-Warm Electric Co., Ravenna, O., has published a bulletin on its line of automatic electric heaters for glue. Information is presented on the construction of the various types of heaters.

INSULATING FIRE BRICK—Data on the properties and application of its line of insulating fire brick are contained in a bulletin recently issued by the A. P. Green Fire Brick Co., Mexico, Mo.

AIR FILTERS — Cune Engineering Corp., Meriden, Conn., has published several bulletins devoted to its line of mechanically cleaned filters. Photographs show construction and installation in a variety of fields.

ELECTRIC INSTRUMENTS — General Electric Co., Schenectady, N. Y., has published its 1934 catalog on electric instruments which supplies information on standard lines of switchboard, portable and laboratory instruments.

MICROSCOPES—Bausch & Lomb Optical Co., Rochester, N. Y., recently has published an interesting booklet on research microscopes and accessory equipment. Illustrations show the numerous types of equipment available.

CENTRIFUGAL PUMPS—Data including capacities, speeds and horsepower, specifications and lists of parts are included in a folder on centrifugal pumps recently published by the Worthington Pump and Machinery Corp., Harrison, N. J.

RUBBER TIRES—B. F. Goodrich Co., Akron, O., recently has published a booklet on its new line of rubber tired wheels for industrial trucks. The booklet discusses advantages of that type of wheel, gives data concerning operating tests and illustrates uses of the wheel.

VALVES—Jenkins Bros., 80 White street, New York, has prepared a 12-inch cut-out replica of its standard iron body gate valve which shows the exterior, and the mechanism of the unit. Features claimed for the valve also are presented.

MONEL METAL—International Nickel Co. Inc., 67 Wall street, New York, has published a revised data book on "The Application of Monel Metal and Nickel to Industrial Processing Equipment." Information also is presented on mechanical properties, physical constants and technological properties.

SPRAY NOZZLE — Deister Concentrator Co., 905 Glasgow avenue, Fort Wayne, Ind., has published a bulletin on its spray nozzle which delivers an effective unbroken sheet stream of water at the proper working pressure. The nozzle is used as a single unit or assembled in multiple.

AIR CONDITIONING — Clyde R. Place, Graybar building, New York, recently has published an interesting booklet entitled "Air Conditioning Planned and Proved." The text discusses the development of air conditioning, the results accomplished by air conditioning, and the savings which may be secured by the use of that process.

ROLLER BEARINGS—Bantam Ball Bearing Co., South Bend, Ind., recently has published a new catalog on its line of straight roller radial and roller thrust bearings. Dimensions and capacities in both inch and metric sizes are given for radial roller bearings as well as the other type of bearings described. A table of speed factors is included.

MAGNESIUM — Dow Chemical Co., Midland, Mich., has published an extensive catalog on its line of chemicals and other products including magnesium and dowmetal. Information on magnesium includes properties, specifications and uses, and that on dowmetal deals with the physical constants, mechanical properties and uses of the alloy.

AIR CONDITIONING—"It's In The Air" is the subject of a booklet recently issued by the General Electric Co., and devoted to its line of air-conditioning equipment. The text is well-illustrated with reproductions of photographs of both commercial and residential buildings in which air conditioning equipment has been installed.

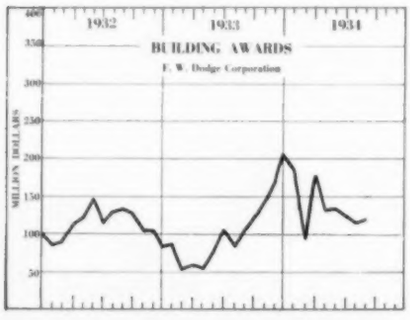
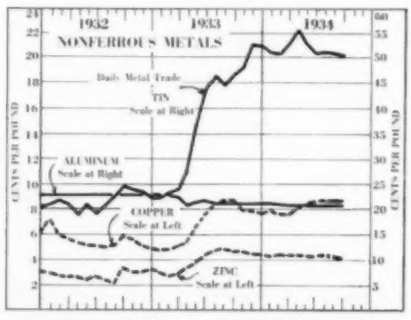
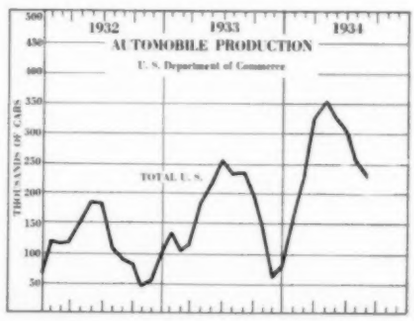
PACKING—Johns-Manville, 22 East Fortieth street, New York, has published an interesting catalog describing its line of packings for practically any industrial service. The text includes packing recommendations, a discussion of methods to secure the best results from packings, approximate weight of packings, etc. A page also is devoted to the company's line of refractory cement.

SPEED REDUCERS—Link-Belt Co., 910 South Michigan avenue, Chicago, has issued a 32-page catalog on its line of speed reducers. Horsepower and other engineering data, dimension diagrams, etc., are included. The publication covers single, double and triple reduction units of the herringbone gear type, and also a line of flexible couplings.

BENTONITE—Silica Products Co., 700 Baltimore avenue, Kansas City, Mo., recently has published a revised edition of its bulletin No. 107 on bentonite. Information is presented on properties, sources, geology, production and uses. Under special uses for bentonite, considerable data is included on that material as a binder for foundry molding sands. Specifications for bentonite also are presented.

ELECTRIC FURNACES—A lift-and-swing-aside roof type quick-charge electric melting and refining furnace is described and illustrated in a bulletin recently published by the Pittsburgh Lectromelt Furnace Corp., foot of Thirty-second street, Pittsburgh. Drawings show details of construction and operation and the text points to advantages of the furnace in reducing the intervals between heats.

HEAT TREATING—R. & H. Chemicals department, E. I. Dupont De Nemours & Co. Inc., Wilmington, Del., has published a manual for heat treating steels with cyanides and salts. Information covers the procedure to be followed in case hardening, reheating, nitriding and mottling steels with sodium cyanide. It also includes the procedure for coloring, tempering and drawing steels with heat treating salts.

ACETYLENE FLAME—Linde Air Products Co., 30 East Forty-second street, New York, has published a bulletin entitled "101 Uses for the Air-Acetylene Flame." The text points out that the air-acetylene flame does not take the place of the oxy-acetylene flame, but serves as a supplementary tool for use where lower flame temperatures are required. The company also has published a bulletin on "Maintenance of Reciprocating Parts."

GRINDING WHEELS—Carborundum Co., Niagara Falls, N. Y., has published a booklet entitled "A Treatise on the Dressing and Truing of Grinding Wheels." The discussion was prepared by H. J. Wills of the research department of that company. Information includes a description of wheel dressers, general application of abrasive wheel type dressers, diamond recommendations for specific application, general rules for application of diamond tools and general rules for miscellaneous truing and dressing.